DOWNLOAD PDF ETHANOL PLANT DEVELOPMENT HANDBOOK

Chapter 1 : Ethanol Plant Development Handbook - download pdf or read online - TIVOLI Library

Ethanol Plant Development Handbook quotes calendrierdelascience.com had over 24 years involvement in the ethanol industry. Was the co-author and editor ed wilson pdf of the Ethanol Plant Development Handbook and she contributed to.

The dramatic growth in ethanol consumption as a fuel has been driven by political, economic, and social agendas that have sought to Reduce national dependencies and expenditure on fossil fuels Reduce the emission of greenhouse gases GHG Develop new economies based on indigenous resources Stimulate employment and economies in rural areas Generate innovation and technology for future generations To encourage demand, governments have provided various incentives, subsidies, protectionist policies, and legislative policies such as fuel mandates. The following pie chart presents world consumption of ethanol: Hydrous ethanol can be used as a direct replacement for gasoline in specially designed vehicles such as flex-fuel vehicles or blended with gasoline as anhydrous ethanol at various levels depending on local mandates. Ethanol may also be used to produce the fuel ether, ethyl tertiary-butyl ether ETBE , which is added to gasoline as an oxygenate and octane improver. Ethanol consumption has surged over the last 20 years, driven by the demand for ethanol as a motor fuel. By comparison, the ethanol fuel industry in Europe, Asia, and the rest of the world is still in its infancy. In the United States, the ethanol industry was helped by the gasoline demand turnaround, as the low oil prices since late have boosted gasoline consumption. Ethanol consumption and capacity expanded from to after several years of no growth. Large-scale cellulosic ethanol projects have had a difficult time starting commercial production because of high production costs, especially after the oil price decline. In Brazil, the ethanol industry is going through a period of consolidation with a limited number of new plants coming onstream. Brazilian ethanol producers are able to balance the supply of sugar or ethanol depending on the economics of each market and the particular harvest in any given year. In Europe, the latest proposals to amend the Renewable Energy Directiveâ€"capping conventional production techniques and considering indirect land-use change in the calculation of GHG emission savingsâ€"have left the industry and member states with a strong headwind in meeting targets as second-generation fuel technologies have proved challenging. The Chinese government sees huge growth potential, and announced ambitious plans in to expand the use of ethanol gasoline for vehicles to promote the environmentally friendly fuel, as well as consume surplus grain. The introduction of the E mandate will be met by a phase of new ethanol facilities utilizing feedstocks from coal-based acetic acid, corn, sorghum stalk, and cassava. Several fuel ethanol projects are under constriction. Growth rates could be significantly higher, but would require a commitment from governments, industry, and consumers generally toward the increased use of biofuels through mandates and incentives. In addition, any changes to legislation surrounding the use of diesel fuel could reignite demand for gasoline. In Europe, proposed changes to the taxation of fuels to account for energy content and CO2 emissions could benefit gasoline at the expense of the dominant diesel market. In the longer term, advanced fuels provide exciting alternatives to conventional ethanol production. However, these will not provide major contributions over the next five years, leaving the conventional ethanol industry with a difficult climate, especially in light of recent declines in crude oil prices and tightening national budgets.

Chapter 2 : Ethanol Plant Development Handbook - Google Books

Aage R. Mller's Cochlear And Brainstem Implants PDF. This present day, cochlear implants are the main profitable of all prostheses of the anxious process. they're utilized in people who are deaf or be afflicted by a critical listening to deficiency attributable to lack of cochlear hair cells.

McAloon at or AMcAloon arserrc. Abstract The corn dry-grind process is the most widely used method in the U. Increasing demand for domestically produced fuel and changes in the regulations on fuel oxygenates have led to increased production of ethanol mainly by the dry-grind process. Fuel ethanol plants are being commissioned and constructed at an unprecedented rate based on this demand, though a need for a more efficient and cost-effective plant still exists. A process and cost model for a conventional corn dry-grind processing facility producing million kilograms per year 40 million gallons per year of ethanol was developed as a research tool for use in evaluating new processing technologies and products from starch-based commodities. The model is based on data gathered from ethanol producers, technology suppliers, equipment manufacturers, and engineers working in the industry. Intended applications of this model include: Another example gave a reduction from to million liters per year as the amount of starch in the feed was lowered from This model is available on request from the authors for non-commercial research and educational uses to show the impact on ethanol production costs of changes in the process and coproducts of the ethanol-from-starch process. Corn; Ethanol; Dry-grind; Coproducts; Economics 1. Introduction The corn dry-grind process is the most widely used method in the U. Research towards developing new, valuable coproducts and more efficient processing technologies aim to reduce the overall cost of producing ethanol Bothast and Schlicher, ; Rajagopalan et al. The feasibility of producing these coproducts or using new processing steps is currently evaluated by performing calculations that scale-up benchtop or pilot plant operations. The producer accepts the risks of attempting and evaluating a given processing technology. Even the reduction in cost of a few cents per gallon of ethanol produced, is significant when dealing with the dry-grind process, and the ability to accurately predict the costs of production prior to incorporating new technologies is highly desirable. Computer simulations to model and predict the costs of production have been used with success for many industrial processes. They provide the ability to estimate the effect of increasing costs of raw materials or utilities, variations in material composition, and the incorporation of new technologies. Beginning with a base-case scenario and designing the model to simulate those conditions effectively allows the user to estimate results of alternative processes with confidence. Previously models of the dry-grind ethanol from corn process McAloon et al. The following is a description of this model along with analyses to determine the effect of changing corn cost and starch composition. Process model description A simplified flow diagram of the process is shown in Fig. The actual process contains more than pieces of equipment and unit operations. It is not intended to replicate any fuel ethanol plant in existence, but rather a generic plant design containing equipment and unit operations necessary to convert corn into fuel ethanol. Volumes, composition, and other physical characteristics of input and output streams for each equipment item are identified. This information becomes the basis of utility consumptions and purchased equipment costs for each equipment item. For corn, composition varies greatly by year and location, and this may be adjusted easily when declaring the composition of the feed. The nominal composition of corn used in this simulation and the composition used in the sensitivity analysis are given in Table 1. Non-starch polysaccharides are made up of corn fiber pericarp and endosperm fiber and other potentially valuable or fermentable components. Other solids are materials such as cleaning compounds, minerals, and other residual matter in the process. Although corn was used as the basis for this process, other agricultural products high in starch may also be input to the model, though the process may require the user to adjust the given unit operations or incorporate new operations to accommodate the new feed. The amount of material fed into the plant may be easily changed as well, allowing a user to estimate plant output based on feed availability. Based on the experimental data for composition and behavior in these unit operations, the yield of ethanol may be estimated. Table 2 gives an overview of some of the key unit operations and settings in the process model. Grain receiving Corn is brought into the facility and held in storage silos prior to cleaning, where broken corn, foreign objects, and finer materials are removed using a blower and screens. A portion of the stream may be recovered and added back to the distillers dried grains with solubles, but the current setting is for the broken corn and foreign objects to go to waste. These silos are sized to hold sufficient corn for 12 days of plant operation. The cleaned corn is ground in a hammer-mill and sent through weighing tanks to control the feed rate to the process. Alpha-amylase is added at 0. During the gelatinization step, there is a sharp rise in the slurry viscosity that is rapidly decreased as the alpha amylase hydrolyzes the starch. Liquefaction is done at pH 6. The backset provides critical nutrients for the yeast later in fermentation. Further conversion of the oligosaccharides by glucoamylase to glucose is referred to as saccharification. Sulfuric acid is used to lower the pH in this tank to 4. Glucoamylase is added at 0. During this incubation, almost all of the dextrins are converted to glucose although the glucoamylase continues to be active and can continue hydrolysis during fermentation if there are any unhydrolyzed dextrins remaining. Fermentation is the conversion of glucose to ethanol and carbon dioxide using yeast. The fermentation simulated in the process model is a batch process with six fermentors of approximately 1. Cooling is continuous as the conversion of glucose to ethanol produces kJ per kg of ethanol produced Btu of heat per pound of ethanol Grethlein and Nelson, The extent of conversion is set according to experimental or process data, and the current fermentor output is The beer from the fermentation is heated using the process stream inlet to the saccharification tank, and then sent through a degasser drum to flash off the vapor. The vapor stream is primarily ethanol and water with some residual carbon dioxide. The ethanol and water vapors are then condensed and recombined with the liquid stream prior to distillation. Any uncondensed vapor is combined with the carbon dioxide produced during fermentation and sent through the carbon dioxide scrubber prior to venting or recovery. Distillation and ethanol recovery The first step in ethanol recovery is the beer column, which captures nearly all of the ethanol produced during fermentation. The outlet from the bottom of the distillation column contains a considerable amount of water and non-fermentable material such as protein, oil, fibers, and residual chemicals unconsumed during fermentation. Recovery of the ethanol from the beer column distillate is accomplished through the combined action of the rectifier, stripper, and molecular sieves. The remaining bottoms product is fed to the stripping column to remove additional water, with the ethanol distillate from stripping being recombined with the feed to the rectifier. The distillate of the rectifier, containing primarily ethanol, feeds the molecular sieves, which captures the last bit of water, creating Molecular sieves are composed of a microporous substance, designed to separate small molecules from larger ones via a sieving action. Water molecules are trapped and adsorbed inside the microporous beads, whereas the larger ethanol molecules flow around them. The water produced when the molecular sieves are regenerated by heating in an offline operation, is combined with the process condensate stream used to slurry the incoming ground grain. The liquid product from centrifugation, known as thin stillage, is split and used as backset, with the rest going on to the thin stillage tank. The thin stillage tank helps to maintain a constant feed to the evaporator, where water is recovered and the concentrate is dried further. The four-effect evaporator uses the overhead vapors from the rectifier instead of steam to provide heating for the first effect of the evaporator. The heated process streams are used in following effects of the evaporator. Outgoing vapor from the evaporator is condensed and mixed with the rest of the process condensate, which is used to slurry the ground grain at the beginning of the process. The drum dryer reduces the moisture content of the mixture of wet grains and evaporator concentrate from The volatiles produced during drying are treated with a thermal oxidizer prior to exhaust from the facility. The DDGS produced is sold as an animal feed with its value based largely on protein content. The DDGS normally has a protein content of Cost model description The Dry Grind cost model integrates data developed in the process model with current ethanol production cost information to allow the user to see the economic impact of modifications to the ethanol production process and products. The current ethanol cost information, which is based on equipment and operating costs and descriptions obtained from industry sources, was combined into an estimate of ethanol production costs using generally accepted methods for conducting conceptual technical and economic evaluations in the process industry Jelen, ; AACE Intl. The information in the model is not specific to a particular dry grind plant but is representative of a modern facility. The plant operating costs are based on published material and utility costs and use salaries typical in rural central U. Costs agree with actual ethanol production cost information collected in surveys conducted by the USDA Shapouri et al. Ethanol dry grind plants operate 24 h per day, year-round, with time set aside for maintenance and repairs. Equipment costs Process and equipment details vary from facility to facility as several technology suppliers provide the process design, equipment, and construction for ethanol facilities. Some facilities use stainless steel in their equipment while other facilities use carbon steel. In some facilities, steam is used to dewater the wet grains left after the ethanol is removed, while others use direct fired gas heaters, and a few organizations simply sell the grains wet. The pricing for the major process vessels in this study is based on stainless steel construction and information for specific pieces of equipment is included in the model. The purchased costs for the major equipment items were based on budgetary quotations from equipment suppliers and erectors. A discussion of the application of adjusting equipment costs to compensate for changes in capacities can be found in various publications Jelen, ; Remer and Chai,; Dysert, Additional literature on the construction of ethanol plants is available as well Henderson et al. Additional equipment costs are included for the clean-in-place, plant air, and wastewater treatment systems that are not shown on the process diagram but are required. The scaled energy requirement quantifies the energy requirements of distillation more accurately when calculating utility and equipment costs. Feedstock costs The primary feedstock for the facility is shelled corn. Enzymes to convert the starch in the corn to glucose, yeast to ferment the glucose into ethanol and carbon dioxide, gasoline for denaturing the ethanol, and small amounts of other feedstocks are also required. The volumes of materials required are provided by the process model and their unit costs have been incorporated into the model and can be easily modified as market conditions change. Pricing information for the various feedstocks is based on current published market prices and, information collected by federal agencies such as the USDA Baker and Allen, and the Department of Energy EIA, accessed Nov. Product values Three products are produced in the conversion of corn to ethanol by the dry grind process. They are ethanol, DDGS, and carbon dioxide. The denatured ethanol is sold as a commodity to distributors and normally blended with gasoline as a fuel oxegenate. Current pricing for it is readily available Axxis Petroleum, The DDGS are sold as an animal feed and the market value is determined primarily from its protein content and the market pricing for other protein-based animal feeds. The carbon dioxide is often vented to the atmosphere since the cost of purifying and transporting to the end user, often outweighs any economic gains from selling it. The normal practice would be to sell it to a third party at the plant site for purification and distribution. Our model does not include any income from the sale of the carbon dioxide but could easily be modified to do so. Utility costs Electricity, steam, natural gas, and cooling water are the utilities required in the process. Utility requirements of the various equipment operations are calculated and totaled within the program.

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Chapter 3 : Community Wind Development Handbook | Open Energy Information

Ethanol and the Environment Ethanol made from corn has gotten more attention, by far, in Congress and in the media, than any other form of biomass energy. Corn-based ethanol is a favorite of companies that farm corn, biotech companies, pesticide manufacturers and politicians from Midwest states.

Understanding the Growth of the Cellulosic Ethanol Industry. This document serves as a guide for blenders, distributors, sellers, and users of E85 as an alternative motor fuel. It provides basic information on the proper and safe use of E85 and offers supporting technical and policy references. Ethanol is a renewable, domestically produced fuel that can be made from grains, such as corn or wheat, or from biomass or cellulose sources, such as prairie grass and agricultural, forestry, or municipal waste matter. Several research studies show that E85 has the potential to substantially reduce petroleum fuel use and greenhouse gas emissions GHGs. Driven by increasing gasoline prices, the market for E85 is growing. With consumer demand for alternative fuel vehicles AFVs increasing, auto manufacturers are working to produce more flexible fuel vehicles FFVs , which are capable of operating on E85 or gasoline or a combination of the two. As of May , there were 8. FFVs are available in most vehicle classes, including sedans, minivans, trucks, and sport utility vehicles. The number of E85 fueling stations is growing rapidly nationwide. As of June , there were 2, retail stations out of , nationwide offering E85 across the country. Several key factors affecting E85 growth and acceptance were recently addressed. Environmental Protection Agency EPA issued a guidance document to states defining a process by which they could determine whether "Stage II" gasoline vapor recovery equipment would be required for new E85 pumps. In October , Underwriters Laboratories, Inc. In addition, UL announced equipment listed for E85 use in June This report identifies, outlines, and documents a set of plausible scenarios for producing significant quantities of lignocellulosic ethanol in These scenarios can provide guidance for setting government policy and targeting government investment to the areas with greatest potential impact. The analysis underlying the scenario-generation exercise focuses on understanding the impact of two types of proposed government policies on the deployment of cellulosic biofuels technologies: Policies focused on reducing operating costs associated with cellulosic ethanol production. These policies include payments to feedstock producers and subsidies associated with production of cellulosic ethanol. Policies focused on reducing capital costs associated with cellulosic ethanol production. These policies include capital subsidies for construction of full-scale cellulosic ethanol production plants.

Chapter 4 : ICM INC - The Energy of Innovation

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Biodiesel is typically made by chemically reacting lipids e. Provides information and links to various sites of interest for biodiesel users. Vegetable oil can be used as an alternative fuel in diesel engines and in heating oil burners. When vegetable oil is used directly as a fuel, in either modified or unmodified equipment, it is referred to as straight vegetable. Comprehensive Guide for Algae-based Carbon Capture. Randall von Wedel, Ph. As the fossil fuels are depleting day by day, there is a need to find out an alternative fuel to fulfill the energy demand of the world. Biodiesel is one of the. Biofuels supplies and suppliers: This is the only book that thoroughly covers the entire subject of making your own biodiesel â€" all the information at the Journey to Forever website and very much more. Learn how to make top- quality biodiesel that will pass all the quality standards requirements every time. Making your own biodiesel will save you thousands. Build a 3- inch ethanol still â€" Click HERERoger Sanders has updated his popular improved version of the Mother Earth News waste oil heater with a great deal of new information and new options. This waste oil heater solves all the problems that made the original MEN version difficult to use. It can save you thousands of dollars in heating bills. Spanish- language version HERE. If you should buy any of these products, please advise the vendors that you read about their products here. Straight vegetable oil systems. Pour- point depressants, winterising equipment. How to make soap. Multifuel lamps and stoves. Flex- fuel ethanol conversion kits. Automatic temperature control valves. Supplies for the homebrewer from Duda. Analytical testing, laboratory equipment. Biodiesel additives - - from Biofuel Systems, UK: Biofuel Systems in the UK design and build state- of- the- art complete biodiesel processing systems, complying with the highest safety requirements and producing biodiesel from a range of feedstocks to meet all recognised standards including EN1. Custom- built to individual specifications. Ageratec Sweden makes automated biodiesel processors using sequence controllers, ranging from 8. ENThere are as yet no home- scale ready- made biodiesel processors on the market that are worth having. See for instance this message to the Biofuel mailing list: In the US, try race circuits. Contact any bulk, liquid fuels distributor for 5. Their customer base is largely dependant upon methanol availability. If you know anyone who races, they may be willing to part with small quantities. These distributors have access to unblended methanol in all quantities. Methanol in small quantities, "for getting started", and in 5. Diesel Biodiesel Supply - - buy online: Call center Pennsylvania 8. VP Racing Fuels sells pure methanol and has a world- wide distribution network. Hiperfuels - - Methanol, 1- gallon, 5- gallon, 5. Contact Jess Hewitt, jhewitt ix. Methanex - - one of the largest suppliers in the world. Sales inquiries sales methanex. North America , 6. H testing Cheap testers can be a false economy. Good instruments are available for a reasonable price. Resolution should be 0. H Range 0- 1. H, Temperature resolution 0. H, Digital automatic calibration, Replaceable electrode. H Tester - - Waterproof, p. H, Temperature Range 0- 6. H from Eutech - - useful FAQs on using and maintaining p. Technical Tips - - p. Natural test papers - - Cabbage Paper is made of red cabbage leaves - - alkalis change it to green, acids to red. H testing methods are phenolphthalein solution from a chemical supplies company - - NOT "phenol red" - - and p. H test papers, which come in various ranges. Buy phenolphthalein solution online from Duda. WVO Titration kit from Duda. American Weigh AMW- 1. Silver Precision Digital Pocket Scale, 0. Dry- washing"Dry- washing" can be useful where water is scarce or expensive. Ion- exchange resins for dry- washing can remove salts, soap, catalyst, glycerine and water from raw biodiesel following separation of the glycerine by- product. Pumps for biodiesel - - macerator pumps, diaphragm pumps, buy online from Duda. Biz is an international distributor of over 9,0. We have been selling pumps to many biodiesel customers over the years. We also pride ourselves in being true pump engineers with lots of knowledge about pump design and pump applications. Pumps FAQ from Pump. Biz - - General Pump Information: Main characteristics to be considered. Impeller Diameter and RPM3. Pump Characteristic Performance curve. Time, Temperature and Pressure effectshttp: Little Giant pump - - This 1. Originally designed by Little Giant as a solvent pump. Relatively fast, about 3. Pony Pump from Flotec - - 1. Northern Tools - - Cast Iron 1in. Clear Water Pump, Model 1. Warning - - very BAD at dealing with international orders! Enhanced Self- Priming Pumphttp: Trash pumps work on warm days and can handle burger patties well.

Chapter 5 : PDF Download Handbook Of Cellulosic Ethanol Free

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This booklet is revised and reprinted by Equistar as regulatory changes make it necessary. Equistar was formed in December and has 16 manufacturing sites located primarily along the U. Gulf Coast and in the Midwest. The Law and Ethyl Alcohol. Services of Equistar Chemicals, LP. What Is Ethyl Alcohol. The Sources of Industrial Ethyl Alcohol. Fermentation of Agricultural Products. Synthesis From Natural Gas. Anhydrous Alcohol by Molecular Sieve Distillation. Synthesis of Ethyl Alcohol from Ethylene. Uses of Industrial Alcohol. Typical Industrial Alcohol Applications. Myths and Realities Ethyl alcohol has probably been used by human beings as a beverage for at least centuries. Each culture has its own myths about the discovery and significance of this potent liquid. Who discovered it, and how the discovery came about, are lost in antiquity as is the discovery of fire and the invention of the wheel. But, however, and by whom alcohol came into existence, much has happened because of it. Some contend it started the first community life, since several years are required to produce a vineyard. Thus, the pursuit of the fermented product of the juice of grapes may have changed the nomadic pattern of early man to a settled one. The historical references to alcohol do not appear until 60 or 70 centuries ago in the Hebrew script, on Babylonian tablets, and in ancient Egyptian carvings picturing the manufacture of wine by fermentation. Wine was believed to be made in China before B. The Bible holds wine in high esteem, suggesting that wine is a gift of God, referring to bread and wine as staples of the diet, and including wine as a measure of hospitality and of value as a medicine and an anesthetic. Alkohol or "the fine powder" referred usually to a finely powdered antimony sulfide used in cosmetics to darken the eyelids. For example, ferrum alcoholisatum was finely powdered iron. Gradually the word came to mean "essence", and Paracelsus defined it in the 16th century as the most subtle part of anything. It was not until the 19th century that the term alcohol came to be used generally for wine spirits. ETHYL ALCOHOL Probably because of its being the essence of wine and the intoxicating ingredient in many beverages whose production involved a fermentation process, ethyl alcohol must have been one of the earliest organic compounds to be investigated. Despite the Arabic origin of the word alcohol, the separation of ethyl alcohol from wine was apparently unknown to Arabian alchemists. The earliest known description of the concentration of ethyl alcohol by distillation of wine occurs in a Latin manuscript of the 12th century. It is assumed that ethyl alcohol was first separated by distillation around the 11th century in the wine districts of Italy. Although ethyl alcohol had been known for a considerable time in a crude state in wines and beer, it was not until that Johann Tobias Lowitz first prepared it free of water. Its structural formula was established by Sir Edward Frankland later in the 19th century. In the naming of ethyl alcohol, the limiting term ethyl refers to the fact that this particular alcohol can be converted to ether. Its solvent power is particularly useful for the extraction of medicinals from plant and animal tissues and for compounding tonics, syrups, tinctures, liniments and antiseptics. It is used in processing vaccines and is essential to the manufacture of pharmaceuticals such as antibiotics, and numerous over-the-counter preparations. As an industrial raw material, ethyl alcohol is involved in the manufacture of adhesives, toiletries, detergents, explosives, inks, chemicals, hand creams, plastics, paints, thinners, textiles, vinegar and other products almost too numerous to mention. While ethyl alcohol has been around since antiquity, scientists today are still discovering new and important uses for it. Watch the contrail of a jet thread the sky with its wisp of white. Stroke the satinsmoothness of a graceful racing sloop. Ethyl alcohol is involved. Until the pressing needs of industry precipitated changes in the law, the principle of taxing and regulating alcoholic beverages was applied to all forms of ethyl alcohol, regardless of its ultimate use. In those countries where no special legislation had permitted the use of tax-free alcohol for industrial purposes, a heavy burden of taxation was placed on every gallon of ethyl alcohol produced. For alcohol, in the view of the law, was a beverage of luxury. Its consumption had, for centuries, provided a rich source of tax income. Until the middle of the 19th century, no government was willing to jeopardize this income by eliminating the tax on pure alcohol which, although destined for industry, might have been diverted, taxfree, into alcoholic beverages. Realizing that this vital commodity had to be made economically viable for use in its emerging industries, England, in , authorized the use of tax-free alcohol for manufacturing purposes. To enjoy this privilege, and to prevent the diversion of industrial alcohol into beverages, manufacturers were directed to add an impure methyl alcohol to the ethyl alcohol they produced. In this way "methylated spirits" became a material of growing significance in the chemistry of manufacturing, and the concept of denaturing was established. Applications for denatured ethyl alcohol grew as the laws governing its use were liberalized. The Netherlands legalized the use of denatured alcohol in ; in , France permitted its use under a special tax; and in , Germany relaxed its regulations. By the turn of the century, most of the countries of Europe had facilitated the use of industrial ethyl alcohol. The United States was just emerging as an industrial power and was, therefore, only beginning to consider the need for tax-free industrial alcohol. When incorporated in as the U. This law removed the tax on alcohol intended "for use in the arts and industries and for fuel, light and power," provided the alcohol was denatured and rendered unsuitable for use as a beverage. Pure, undenatured ethyl alcohol was also relieved of the restrictive tax burden if its application to scientific purposes could be guaranteed by the users. In addition, strict controls were imposed upon the distribution of pure industrial alcohol to prevent its illegal use in beverages. Today in the United States, official regulations governing production, procurement and use of pure ethyl alcohol and denatured alcohol are issued by the Bureau of Alcohol, Tobacco and Firearms ATF , U. From the time of the passage of the Tax-free Alcohol Act, Equistar and its predecessor companies has been acknowledged as a leader in major constructive developments in this field. The ethylene is used at Tuscola for the synthesis of proof and proof ethyl alcohol and purified ethyl ether. The current ethanol production facility was commissioned in , replacing the original plant built on the Tuscola site in The plant has been subject to multiple improvements over the years, including the addition of a molecular sieve, which is used to produce anhydrous proof product. The government assigned identification numbers for these facilities are: Periodic inspection by authorized representatives of these agencies as well as representatives of such groups as the Kashruth Division, Union of Orthodox Jewish Congregations of America affirm continued compliance to the highest standards and regulations. The experience and knowledge of Lyondell trained personnel is available for suggesting proper formulas and for assistance when filing the necessary government regulatory forms. We urge you to call for help with any problems you have relating to industrial ethyl alcohol. What Is Ethyl Alcohol Chemically, ethyl alcohol is the common name for the hydroxyl derivative of the hydrocarbon ethane. This relationship is clearly demonstrated by the structural formulas for the two compounds.

Chapter 6 : Kathy Bryan - Fuel Ethanol Workshop and Expo

Kathy was the co-author and editor of the Ethanol Plant Development Handbook and she contributed to the quality and integrity of BBI International's publications and conferences in innumerable ways over the years. Her leadership, guidance, and her vast industry connections were invaluable to the success of the company and to everyone she.

Bio-fuels such as ethanol and bio-diesel have significant potential to substitute for petroleum to reduce this dependence on imported fossil fuels. The oxygen content in bio-fuels also provides important environmental benefits for reducing pollutant emissions SOx, NOx , and reducing net additions to atmospheric CO2 thereby mitigating potential harmful effects of global climate change. Presently, production of ethanol in the United States is about 4 billion gallons annually, and is an important component of the motor fuel supply. Ethanol is mixed with gasoline at rates of 5 to 85 percent to make reformulated gasoline. Most fuel-grade ethanol in the United States is currently produced from corn, an abundant, low-cost commodity, concentrated in the US mid-western region. Presently, there are two types of ethanol-blended automobile gasolines: E10, which is the most common type of ethanol-blended gasoline, containing 10 percent ethanol and 90 percent unleaded gasoline, can be used in most cars, and can be purchased at many gas stations. E85 is a blend that contains 85 percent ethanol and 15 percent gasoline, but can be used only in Flexible Fuel Vehicles FFVs , and can be found only in a few gas stations in the United States Pollack, Currently, there are about E85 fuel stations compared to about , gasoline stations , and 5 million FFVs mostly as fleet vehicles in the United States Mello, To take advantage of the favorable climatic conditions for biomass and bio-fuel production, Florida has over 20 years of experience in research and development on various aspects of biomass crop production and conversion of biomass to energy sources such as ethanol, methane, and electricity. This paper presents information on the potential feedstock sources that may be used for ethanol production in Florida. Conversion of cellulosic materials to ethanol has not been considered as a near-term technology in this publication. While cellolosic materials such as wood and grasses may be converted to ethanol, the saccharification of cellulose is difficult and complex, requiring micro-organism development in laboratories via genetic engineering Ingram and Doran, This conversion methodology has yet to be applied on a commercial scale. Sugarcane grown on about , acres in Florida produced Average sugarcane yields range from 32 to 38 tons per acre, and vary based on characteristics of soil type, crop year, harvesting, and other agricultural practices. While sugarcane is not a new crop in Florida, growing it as feedstock for ethanol may be considered a new use. It should be noted that at the present time, there is no facility for conversion of sugarcane to ethanol in Florida; however, there is the potential for sugarcane-to-fuel ethanol production. The average cost of sugarcane and its sugar content are important factors for producing ethanol from sugarcane. These factors depend on the variety of sugarcane, type of soil, field preparation, and other agricultural practices, and may also vary by crop year. Sugarcane contains about 85 percent juice, which has roughly 11 percent sugar by weight Baucum et al. There are two main components to the conversion of ethanol from sugarcane: Since the cost of producing sugarcane is dependent on several factors, the cost of ethanol from sugarcane in Florida can be estimated within a range. Presently, there is no commercial sugarcane used for fuel ethanol in Florida: The cost of sugarcane delivered at the mill represents nearly two-thirds of the final ethanol cost Leitz, This figure also includes the benefit of burning bagasse sugarcane byproduct , which reduces the cost of processing. Cost estimates were based on gallons of sugarcane juice from 1 ton of sugarcane. Conversion rates for sugarcane juice to ethanol may vary based on sugar content. Higher sugar content produces more ethanol. As can be seen in Table 1, the cost of ethanol production from sugarcane in Florida was estimated for four scenarios representing various production costs and sugar content. Within the past 25 years, sugarcane yield has improved by 33 percent, sugar content increased by 8. In addition, while the average yield of sugarcane per acre in Brazil and the United States is similar, sugarcane in Brazil is not irrigated Walter et al. Corn As the predominant source for the production of about 4 billion gallons of ethanol in the United States, corn could also be considered a potential source of ethanol production in Florida. North Florida, particularly the area adjacent to the Suwannee River, has the potential for growing corn as a feedstock for conversion to ethanol. Results from corn variety studies in North

Florida have shown corn yields of over bushels per acre for short-season, irrigated varieties, and bushels per acre for full- and mid-season irrigated varieties Wright et al. However, the cost of producing high-yield corn on irrigated land in Florida is almost twice that for the major U. Another problem is the contamination of Florida corn with aflotoxin a fungous disease , which makes the corn byproduct Distillers Dried Grains, or DDG unsuitable for animal feeding. This could increase the cost of ethanol from corn in Florida; but this problem could be mitigated by using resistant corn varieties. Production of ethanol from corn in the United States is an established technology. One bushel of corn can be converted to 2. These numbers are for corn grown in the major US corn-producing states. In addition, the issue of the suitability of DDG for animal feeding may make the cost of ethanol from Florida-grown corn even higher. There is currently a plan by some investors to buy corn from the US mid-western states as feedstock for corn-to-ethanol production in Florida Keller, It will take time to find out how economically feasible this commercial endeavor will be. Apparently, the feasibility study results have been positive. This cost includes the value of DDG as a credit. The capital cost of a corn-to-ethanol plant is based on capacity, type of equipment, wastewater treatment, processing CO_2, and grain-ethanol milling wet milling, dry milling. The optimum capacity depends on several factors, with feedstock availability being the major factor. Based on various factors, a grain-ethanol dry-mill facility of 40 to 65 million gallons per year is considered the optimum capacity. Higher capacity requires abundant feedstock available nearby. Citrus Byproducts Citrus molasses is a byproduct of citrus-juice processing that can be readily converted to ethanol. The availability of citrus industry byproducts e. Citrus byproducts have been used mainly for animal feeding purposes. There are some facilities in Florida that process citrus molasses to produce beverage ethanol; however, there has not been any experience with conversion of citrus byproducts to fuel ethanol. More than 38, tons of citrus molasses were produced in the production year Florida Citrus Processors Association. Presently, degree Brix citrus molasses is used to produce beverage ethanol and for the formulation of sweetened cattle feed. The price of citrus molasses depends on several factors of which total citrus crop yield in a year is considered to have a major effect. Long-run 15 years projections for Florida citrus production indicate a slight yearly decrease, which is going to affect the production of citrus byproducts as well Spreen et al. The Florida citrus industry produces an average of 40, tons of citrus molasses per year Florida Citrus Processors Association. This amount may vary by several thousand tons based on total citrus production volume per crop year. Some citrus byproducts e. This is a practice that has been used by distiller facilities for many years. Based on the technical data Braddock, , 1 ton of molasses is about gallons and, on average, 4 gallons of molasses is used to produce 1 gallon of ethanol. This ethanol is not fuel grade, and it has to be dehydrated to get Sweet Sorghum Sweet sorghum is another possible source for ethanol, but there has been no experience on a commercial scale. The silage type of sweet sorghum is the type suitable for ethanol production. In Florida, there are over 3, acres of sweet sorghum for silage, with a total yield of over 35, tons National Agricultural Statistics Service, A demonstration project funded by the National Renewable Energy Laboratory, Department of Energy, looked into the possibility of using sweet sorghum among other crops for conversion to ethanol in Central Florida. The results did not provide any clear indication of feasibility for growing sorghum for ethanol using conventional technology. Since the study was done on reclaimed lands in central Florida, some technical issues, such as harvesting on particular soil types, appeared to hinder the agricultural practices during the rainy season. Both sweet and forage sorghum have a high risk for lodging that can result in harvest problems, with ensuing loss of yield from both the initial and ratoon crops Stricker, Sweet sorghum can produce up to 10 dry tons per acre. The cost of sorghum production and its sugar content are crucial for conversion of sorghum to ethanol. Costs of producing growing and harvesting sorghum for silage vary based on the cultivar, soil conditions, harvesting, and agricultural practices. In the North Florida region, silage sorghum yield ranges from 3. Based on results of a study on growing and converting sorghum to ethanol McBee et al. One acre of sorghum Rio cultivar can produce gallons of ethanol, whereas the next best cultivar M produced about gallons of ethanol per acre. Other cultivars registered lower yields for stem but higher grain per acre. Based on this data, 1 ton of sorghum can yield 22 to 48 gallons of ethanol. While there are some cost estimates for sorghum production in Florida, there is no cost estimate for conversion of sorghum to ethanol. Costs associated with conversion include transportation to processing facilities, juice extraction, and processing to ethanol. Without a sorghum-to-ethanol conversion facility to obtain reliable data, any estimates may be speculative. The sorghum-to-ethanol study did not indicate the alcohol content of the ethanol produced. The economic feasibility of each of these crops requires further data and technical analysis. So far, only corn shipped from other states to Florida has been considered for ethanol production on a commercial scale. Sugarcane is an established crop in Florida. Processing sugarcane juice to ethanol is an established technology in Brazil, which has proven to be very successful. Productivity in sugarcane production and efficiency in juice processing and ethanol production have been improved drastically. Any effort toward implementing a sugarcane-to-ethanol industry in Florida has to consider issues such as waste management, sugarcane production costs, and the impact on the sugar market. Currently, the US sugar policy has two main elements: As the sole feedstock source for sugar production in Florida, alternative uses of sugarcane may affect the quantity of sugar production in Florida, which eventually may have some impact on US sugar policy. While analyzing this impact is beyond the scope of this paper, the extent of such probable impacts may be analyzed once the alternative uses of sugarcane are taken into consideration. While citrus molasses is converted to ethanol as an established process, the cost of ethanol is higher, and the total amount of citrus molasses per year is insignificant. Even if the total yearly production of about 40, tons were processed to ethanol, the total ethanol produced would be about 1. Ethanol processing is sub-economic for plants typically less than 40 million gallons per year. Sorghum cultivars have the potential for ethanol production; however, the agricultural practices for growing sweet sorghum for ethanol have not been established, and the conversion process must be tested and developed at a more expanded level. Considering the best possible scenarios, Table 3 compares the cost per gallon and yield per acre for ethanol from selected feedstocks in Florida. Ethanol Reshapes the Corn Market. An Overview of Florida Sugarcane.

Chapter 7 : Dry-Grind Ethanol from Corn Process

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The Ethanol Plant Development Handbook quotes a natural gas use of 40, Btu per denatured gallon (Higher Heating Value or HHV) and kWh/gal of electricity (assumes % DDGS drying). 2 In , ICM, Inc. a major ethanol plant.

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ethanol plants has been steadily decreasing The Ethanol Plant Development Handbook quotes a natural gas use of 40, Btu per denatured gallon (Higher.