BioCortec® Newsletter

September 2012

Good for AD

Anaerobic Digestion is a well-known process by which organic wastes are decomposed in the absence of oxygen by anaerobic micro-organisms; often resulting in the production of significant amounts of methane gas. Anaerobic Digestion is most commonly used in wastewater and sewage treatment and in the treatment of animal manure waste. Over the past decade, there has been a strongly growing interest in Anaerobic Digestion as sustainable and environmentally friendly way to process biodegradable wastes and as a means to produce renewable energy. Anaerobic Digestion compatible waste bags will enable increased use of this technology.

Anaerobic Digestion Basics

Anaerobic Digestion can be implemented in a wide variety of configurations. Key variables include: temperature (mesophilic ~20-45 C, or thermophilic ~49-70 C), number of chambers/stages, batch or continuous process, solids content in process (high solids 'dry' at 25-40% solids, high solids 'wet' at ~15- 25% solids, or low solids at less than 15% solids), biogas use (burned on site or purified for sale), feedstock(s), and output streams/treatments. Like many technologies, Anaerobic Digestion benefits from economies of scale; but small or medium size installations can be economically feasible in specific situations. Anaerobic Digestion systems can be designed for very efficient land use, for facilities in urban settings. If properly designed and operated they produce no harmful emissions and minimal unpleasant odors.

The outputs of Anaerobic Digestion usually include biogas, fibrous solid/sludge, and process liquor. The latter two may be combined in a slurry. The biogas is typically 50-75% methane. It can be combusted as is or scrubbed/purified for sale as natural gas. The biogas typically contains 25-50% carbon dioxide and small quantities of other gases; including hydrogen sulfide (up to about 3%, which can be removed by scrubbing). The solid/sludge can be used in the same way as compost as a soil improver, or it can be composted after Anaerobic Digestion to increase the breakdown of lignin and cellulose. The process liquor is typically nutrient rich and can be used as a fertilizer. However, if liquor volume is excessive (e.g. with a large low-solids installation), process liquor may be discharged or re-used following additional treatment (primarily to remove nutrients and dissolved solids).

Anaerobic Digestion is an excellent technology for treatment of (and energy recovery from) animal manure and numerous facilities have been constructed exclusively for this purpose. However, other biodegradable feedstocks produce significantly higher biogas yields. Favorable feedstocks include: food waste, paper, yard waste (grass/leaves), and crop residue. The biogas yield can be highly variable based on feedstock and operating conditions. However, a typical yield for food scraps may be about 265 m^3/t and almost 1000 m^3/t for fat and grease. This compares with biogas yields in the range of about 150-200 for grass clippings and yard waste. Except for materials high in lignin (e.g. wood waste), most natural organic materials are readily degraded with Anaerobic Digestion. Somewhat surprisingly, most compostable bioplastics do not degrade quickly in Anaerobic Digestion, especially at lower temperatures.

A study using life cycle assessments (LCA) has shown that Anaerobic Digestion of municipal organic waste is clearly superior to both composting and incineration. A key contributor to the improved LCA is the energy recovered with Anaerobic Digestion (as biogas), compared with the energy input required for turning/aeration of compost. Incineration also recovers energy, but this benefit is offset by greater emissions (of CO_2 and other gaseous combustion products) and the ash waste which may be concentrated in toxic heavy metals. Most (non-recyclable) municipal organic waste now goes to land fill or incineration, with minor amounts diverted to home or industrial composting. Data from the US, for 2010 show that only about 3% of food waste was recovered (through composting). Recovery of yard waste was considerably better (at about 57%). In comparison, about 63% of paper and paper board was recovered through recycling. Thus, municipal organic waste (especially food waste) is a large, favorable, and mostly untapped source of raw materials for Anaerobic Digestion. Implementation of Anaerobic Digestion would show numerous environmental benefits over current disposal methods and provide a clean source for renewable energy. Based on these benefits, many communities are now exploring Anaerobic Digestion as a preferable option. One concern in many countries is the collection infrastructure and logistics, including the availability, cost, and performance of waste bags.

Excerpted from Vol. 7 BioPlastics writen by Cortec's Biodegradable Technologies and Patents Manager, Robert Kean

Plastic Bags Go Really Green

According to the Society of the Plastics Industry (SPI), plastic grocery bags create a 70 percent smaller carbon footprint, consume forty percent less energy and generate 80 percent less solid waste, when compared to paper grocery bags. According to SPI, paper grocery bags have a slight cost advantage over plastic grocery bags.

However, for years, the plastic grocery bag curse was closely attached to the food retail trade. According to estimates deduced from the recent Environmental Protection Agency data on domestic and world plastic bag consumption, a thirteen-figure number of plastic are consumed each year.

An unaccounted number of them (estimates vary wildly, from three percent to sixty percent) end up in the litter stream outside of landfills.

Supermarkets and grocery stores have a hard time steering customers from plastic to the other "greener" alternatives, like paper and even cloth. The lightweight plastic bag, formed as one-piece by folding, welding and die cutting a flat printed tube of plastic film, was introduced by Swedish packaging company Celloplast in the early 1960s. Cheap to manufacture, easy to carry and store, plastic bags have captured at least 90 percent of the grocery store market share.

Current state-of-the-art technology churns out hundreds of printed plastic bags per minute, which consist of ever-thinning film, making this product a very competitive commodity for food retailers and flexible packaging manufacturers alike.

The Recycling/Re-Use Campaign

One might consider the beginning of true industrial recycling in the US in 1988, when SPI created its resin identification coding system. Although the use of the code for plastic packaging is mandated by varying laws in thirty-nine states, it became the de facto national standard.

According to the Association of Postconsumer Plastic Recyclers, there is an effort to increase the recycling of plastics beyond the easiest processed, number one (PET) and number two (high density polyethylene-HDPE), by working with grocery chains to identify all obstacles to utilizing the rest of the plastic materials coded number three to number six (PVC, LDPE, polypropylene ,and polystyrene).

In the US, plastic grocery bags are made from HDPE (code number two), and carry strong printed messages urging consumers to recycle or re-use it. Some grocery chains have even implemented a nickel or dime off a customer's total bill for bringing in his or her own bags to use, instead of taking new ones home.

While the material is in a preferable category for easy process recycling, with the absence of collection channels and an increasing flood of resin imports coming from China (as well as increased domestic production), practical recycling of plastic bags is far from desired.

Bag Bans, Taxes/Surcharges and Biodegradability

Plastic bag debris has become such an environmental calamity that Belgium, Italy, Ireland, Taiwan, South Africa, Australia and Bangladesh have heavily taxed plastic bags or completely banned the use of plastic bags. Several other regions and municipalities in Europe and even some US cities took similar actions, implementing surcharges on plastic bags, a measure that cuts the usage of harmful plastic materials by more than fifty percent. Since 2007, plastic bags have started to be banned on local level, with San Francisco being the first city to introduce such a law.

The recent appearance of biodegradable plastic grocery bags at several major European retail chains represent the industry turn toward biodegradable materials in an effort to reduce the sheer volume of plastic bags not being recycled.

EcoWorks® film, manufactured by Cortec® Corporation, fully biodegrades into carbon dioxide and water within 6-8 weeks, when placed in a typical composting environment, and is intended to replace many forms of low and high-density polyethylene at competitive pricing.

Cortec® dedicated many years of research to develop EcoWorks®, whose flexible film has been certified as 100 percent biodegradable and compostable per ASTM D6400 and DIN EN 13432 by BPI and DIN CERTO certifying agencies.

In the beginning of 2011, plastic grocery bags came back to supermarkets with a new image – biodegradable and safe for the environment. It started in Italy, the country which accounts for more than a fifth of the plastic bags used in Europe which is about 20 billion plastic bags per year. A new law banned bags that are not biodegradable and shop owners are instructed to use bags from cloth, paper or other biodegradable materials. Major Italian retailers, like Billa and Carrefour, already use new grocery bags in support of the Italian Environment Ministry's decision, claiming the new law is a great achievement in reducing the mass amount of plastic bag garbage, decreasing litter and improving the environment.

The jury is still out on how these new laws, bans, taxes and surcharges might be affecting the flexible packaging industry as a whole.

Excerpted from Flexible Packaging Magazine, May 2012

Regulatory prospects offer mixed bag across U.S. for plastic sacks

According to the U.S. House of Representatives, it is estimated that residents of the U.S. use nearly 100 million plastic bags per year-yet only 0.6 percent are recycled. The rest end up in the country's landfills, neighborhoods and oceans, prompting a growing interest among environmentalists, community groups and elected officials to discourage their use through legal measures.

When educational outreach failed to dramatically curb plastic bag use, stakeholders tired of blowing litter, clogged storm drains and the environmental impact of plastic's 1,000-year life span began to get serious about driving consumer preference from plastic bags to reusable ones. In 2007, San Francisco became the first city to pass a plastic bag ban. Since then, an increasing number of bills have made their way to local and state legislators.

Behind the laws are a variety of drivers, from preserving waterways and communities to safeguarding wildlife-and, in some cases, local waste reduction goals. Regardless of their origin, the bills typically take one of three approaches:

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• Bans: These bills ban petroleum-based, and sometimes compostable, plastic bags. Often, the bills include design requirements for acceptable alternatives, such as paper and reusable bags.

• Fees: Some legislation charges customers-typically between five and twenty-five cents-for requesting a plastic bag, with the money collected often used to fund environmental initiatives. A newer trend is to charge for paper bags where plastic ones are banned.

• In-store bag recycling requirements: Other bills require stores of a certain size to provide bins for customers to return plastic bags and/or credit shoppers for using their own reusable bags.

Despite the proliferation of plastic bag proposals, not all bills get passed. While some consumers are vocal about their concerns that the bans are both inconvenient and expensive, plastic industry lobbyists and organizations mount more organized challenges to block their passage. From claims that reusable bags pose health risks and cost Americans more to purchase than disposable alternatives, to arguments that the bills jeopardize a sizable plastic bag manufacturing industry, almost every piece of legislation is met with some resistance.

Excerpted from Packaging Digest, June 2012

Surprise! Toronto Bans Plastic Bags

In a move that caught some city officials and the plastics industry off guard, Toronto's City Council voted to ban plastic bags at retailers effective January 1st.

What started as Mayor Rob Ford's successful bid to eliminate a five-cent fee on plastic retail bags ended up as a complete ban — "the dumbest thing council has done," Ford later said.

"While we're pleased that the bag bylaw has been rescinded, the bag ban seems to have come from nowhere, without any forethought or discourse, and it's a shock," Carol Hochu, president and CEO of the Canadian Plastics Industry Association in Mississauga, Ontario, said in a prepared statement. "We are going to look at all of our available options, including the legality of the ban."

David Shiner, normally a Mayor Ford supporter, brought up the motion during a council meeting June 6. Council passed the ban twenty-four to twenty. The ban was not the result of a study commissioned by city politicians. Compostable and biodegradable bags would not be exempted.

Ford said there is a chance a legal challenge could overthrow the ban. City solicitor Anna Kinastowski, however, said in a newspaper report that a ban might be legally supportable.

The mayor also said on a talk radio program that citizens are partly responsible for the ban vote because they don't follow the council's policies very closely.

According to a report from City Manager Joseph Pennachetti, bag usage in Toronto has declined an estimated fifty-three percent since the introduction of the five cent fee in 2009. The city estimated that in 2008, 457 million plastic bags were used in Toronto. The current estimate is 215 million bags per year — meaning the fee generates $5.6 million for retailers.

According to CPIA data, plastic bags in Toronto represent less than 0.8 percent of waste going to landfills.

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Excerpted from Plastics News, June 11, 2012

LA Says Yes to Bag Ban

The Los Angeles City Council voted 13-1 on May 23rd to take the necessary steps to put into place a ban on plastic bags and a ten cent fee on paper bags. The council's vote directed the City Attorney's Office to draft an ordinance, which will be presented to the City Council in four months. The bag ban was opposed by several Los Angeles-area plastic bag manufacturers, including Command Packaging in Vernon, Calif., and the American Progressive Bag Alliance, which is a unit of the Society of the Plastics Industry Inc. of Washington. Command Packaging said previously that a ban could trigger layoffs of between 20 and 130 employees, while the bag alliance said a ban would impact 1,900 workers in the area.

The law that the council instructed the city attorney to write up will ban plastic bags and require stores to charge ten cents for paper bags.

The vote makes Los Angeles the largest U.S. city to approve a ban on plastic bags.

Excerpted from Plastics News, May 28, 2012

Australian States Seek Federal Plastic Bag Ban

Although some Australian cities, local councils, and three states and territories have banned single-use plastic bags, Sydney-based Planet Ark Environmental Foundation Ltd. says other states are waiting for Australia's federal government to act. Planet Ark recycling campaigns manager Janet Sparrow, said many Australian councils have been working for years to help communities go "plastic bag free" by banning single use, non-compostable bags. However, many states are not inclined to introduce material-specific waste regulations without a federal framework.

"Some states are reluctant to take action on something they see as having national implications or that may be better managed and regulated at a federal level," Sparrow said. Her comments follow a Western Australia city becoming the country's first local government to legislate a plastic bag ban. Fremantle, a costal port city just south of Western Australia's capital, Perth, has drafted a law to ban linear low density polyethylene, high density PE, PET, and polyphenylene ether bags less than 60 microns thick. A Fremantle spokesman said the legislation's first draft was released publicly July 6th, presented to the council's strategic and general services committee July 11th, and is likely to be enacted by the end of 2012.

Fremantle first adopted a strategy to promote plastic bag alternatives in 2004, and several retailers stopped using plastic bags. "This was a non-regulatory approach, so it was never going to reach 100 percent of businesses. The purpose of creating a local law is to compliment this approach with regulation that bans the worst plastic bags," the spokesman said. The Fremantle committee decided to create the law in February. A new working group, comprising lobby group members , retail representatives, bag manufacturers, and council members, was created in March to develop the legislation. Several Australian towns such as Tasmania's Coles Bay and Mogo, in New South Wales, have gone plastic bag free since 2003, but Sparrow said the city of Fremantle will be the first council to enforce the policy with a law.

The law draws on existing legislation already passed in the state of South Australia, and in the Northern Territory and the Australian Capital Territory. Like those governments' laws, Fremantle's law bans plastic bags below a specified thickness and sets a minimum cost for plastic shopping bags. In May 2009, South Australia became Australia's first state to ban HDPE bags. It passed a law prohibiting retailers from selling or giving away carrying bags less than thirty-five microns thick, although "barrier" film bags, used for holding fruit and vegetables, meat or other perishables, are still permitted. The Northern Territory banned lightweight single-use plastic bags Sept. 1, 2011, in a move similar to South Australia's. That legislation also gives NT residents a rebate incentive of A$0.10 to recycle eligible plastic, aluminum, and glass beverage containers.

The Australian Capital Territory was the third state or territory to ban plastic bags. That ban took effect Nov. 1st and requires shoppers to take their own reusable bags to retail outlets or buy them at checkouts. The ban does not apply to barrier bags or compostable bags. Sparrow said there has been serious discussion in Tasmania and in Western Australia about the possibility of adopting statewide bans. In 2010, the island state of Tasmania's Greens Party introduced a motion to ban non-biodegradable HDPE bags; it was supported by both of Tasmania's other political parties, the Labor Party and the National Liberal Party. The government in May said it has set aside A$780,000 (US$812,000) to develop legislation during the next three years. A bill banning plastic shopping bags was introduced into West Australia's Parliament in March by the Labor Party's opposition environment minister Sally Talbot. It sought to ban all plastic bags, with penalties of up to A$20,000 (US$21,000) for supplying them. However, the Western Australia Government rejected the bill.

Excerpted from Plastics News, August 6,2012

White House Eyes Bio-based Products

On April 26, 2012, the Obama Administration released its National Bioeconomy Blueprint, which is intended to provide a comprehensive approach to harnessing innovations in biological research to address national challenges in health, food, energy and the environment. In a related development, the U.S. Department of Agriculture (USDA) proposed on May 1st, 2012, amendments to 7 C.F.R. Part 3201, Guidelines for Designating Biobased Products for Federal Procurement.

"The U.S. is committed to using its purchasing power to increase the bioeconomy."

These notices express the federal government's sustained interest in spurring the development of bio-based products, and its commitment to using its purchasing power to increase the biobased product market. A brief summary of each development follows.

National Bioeconomy Blueprint

Its goal is "to enable a vibrant U.S. bioeconomy in the years and decades ahead, with potential to deliver major economic and social benefits." The blueprint identifies five strategic objectives:

1. Support research and development investments that will provide the foundation for the future bioeconomy;

2. Facilitate the transition of bioinventions from research lab to market, including an increased focus on translational and regulatory sciences;

3. Develop and reform regulations to reduce barriers, increase the speed and predictability of regulatory processes, and decrease costs while protecting human and environmental health;

4. Update training programs and align academic institution incentives with student training for national workforce needs; and

5. Identify and support opportunities for the development of public-private partnerships and precompetitive collaborations — where competitors pool resources, knowledge and expertise to learn from successes and failures.

USDA's Proposed Rule

The major provisions of the proposed USDA rule include:

Designation of intermediate ingredient or feedstock categories. This would follow the same process that USDA uses in the ongoing designation of product categories. USDA would establish a minimum biobased content for each intermediate ingredient or feedstock category, based on an evaluation of available data. USDA would set the minimum biobased content requirement at the highest level practicable, considering technological limitations.

Designation of complex assembly categories. The proposed rule would establish procedures for designating complex assembly products (multicomponent assembled products with one or more component being made with biobased material) within the scope of the federal biobased products procurement preference program. Although Food, Conservation, and Energy Act (FCEA) Section 9001 doesn't specifically mention these multicomponent assembled products, USDA believes that including this type of finished product in the BioPreferred Program "will encourage the increased use of biobased materials and, thus, further advance the objectives of the program."

Replacement of "designated item" with "designated category". Current guidelines use the term "designated item" to refer to a generic grouping of bio-based products identified in Subpart B as eligible for the procurement preference. According to USDA, this has created confusion because the word "item" is also used to refer to individual products, rather than a generic grouping of products. USDA proposes to replace the term "designated item" with the term "designated product category."

In addition, USDA would add a definition for the term "qualifying bio-based product" to refer to an individual product that meets the definition and minimum bio-based content criteria for a designated product category and is, therefore, eligible for the procurement preference.

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Procurement preference for new and emerging markets. USDA would amend paragraph (b) of Section 3201.5 to add a statement that "USDA will designate for preferred procurement those product categories and intermediate ingredient or feedstock categories that are determined to create new and emerging markets for bio-based materials." According to USDA, this would emphasize the Section 9002 objectives "to improve demand for bio-based products" and "to spur development of the industrial base through value-added agricultural processing and manufacturing in rural communities." The new paragraph is intended to replace the current mature market exclusion, which limits the types of product categories eligible for the federal procurement preference. USDA is proposing this change to be more consistent with the objectives and legislative intent of the Bio-based Markets Program.

USDA requests comment on all aspects of the proposed amendments to the guidelines by July 2nd, 2012.

Excerpted from Chemical Processing Magazine, June 2012

Study compares bio-based plastics

"None of the bio-based plastics currently in commercial use or under development are fully sustainable …Some bio-based plastics are preferable from a health and safety perspective, and others are preferable from an environmental perspective." That's the top line conclusion of a study published by the Journal of Cleaner Production, titled "Sustainability of bio-based plastics: general comparative analysis and recommendations for improvement," conducted by the Work Environment Department and the Lowell Center for Sustainable Production, University of Massachusetts-Lowell.

Beginning with the assumption that "bio-based plastics appear to be more environmentally friendly materials than their petroleum-based counterparts when their origin and biodegradability are compared," the study takes a qualitative approach to comparing a range of bioplastic materials, "including all stages of their life cycles (cradle to grave) to assist in decision making about the selection of these materials." In particular, the study evaluates which of the bio-based plastics currently on the market, or soon to be on the market, are preferable from an environmental, health, and safety perspective, plotting the results on a Bioplastics Spectrum.

One of the findings of the study was that "a consensus definition for a bio-based plastic does not exist," adding that "a bio-based plastic is not necessarily a sustainable plastic; this depends on a variety of issues, including the source material, production process, and how the material is managed at the end of its useful life."

For the study, the authors used the twelve principles created by the Sustainable Biomaterials Collaborative as a framework to develop a definition for a sustainable bioplastic and to evaluate the sustainability of the bio-based plastics from the information obtained in the literature review.

The study provided a comparative analysis for the following materials: polyhydroxyalkanoates(PHAs); polylactic acid (PLA) and starch; biourethanes (BURs), cellulose, and polytrimethylene-terephthalate (PTT); proteins from corn and soy; and nano-biocomposites.

After the analysis and evaluation, the study concludes: "Although advances have been achieved, fully sustainable bio-based plastics with all the highly valued properties of conventional plastics for all types of products are not yet available."

The resulting Bioplastics Spectrum places nano-biocomposites at the "Avoid" end of the spectrum, while PLA, starch, and PHA fall on the "Preferred" end. A table of the environmental and occupational health and safety hazards of bio-based plastics indicates that nano-biocomposites (cellulose and lignin) use a process that has relatively high energy and water requirements, emits pollutants to air and water during the craft process, and involves unknown potential toxicity issues related to incineration, composting, and recycling.

Regarding PHAs, PLA, and starch, the study says "although there are some occupational hazards in their production, these hazards were considered lower than that of the other bio-based materials."

Excerpted from Packaging World, June 2012

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