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《产业生态学报》

2003年冬, 第7卷第3-4期, 17-32页

题目: 一个评价以生物质为原料生产化石燃料替代品过程的非特定产品分析框架

作者: Lee R. Lynd, Michael Q. Wang

关键字: 生物能源, 生物质, 能量平衡, 化石燃料, 生命周期评价(LCA), 可再生能源

摘要: 利用生物质为原料来生产燃料和化学制品既有利于保证资源供给的可持续性、增进国家安全, 亦有利于农村乃至整个社会的宏观经济发展, 因而受到越来越广泛的关注。除了产品回收过程, 这一生产化石燃料替代品的流程可被视为有机质的生物处理过程。过程中往往缺乏除产量和发酵好氧或厌氧属性之外的其它特定产品信息。根据以上事实, 本文给出了一个基于单位产品和单位生物质的、用于评价化石燃料替代过程的分析框架, 并发现基于单位生物质的分析比基于单位产品的分析更有助于评价资源和土地利用的功效。下述因素极大影响着化石燃料的生物替代过程: 原料是谷物还是纤维质? 如为谷物, 收割时秸秆是否回收利用? 生物反应是好氧还是厌氧过程? 产品回收的能耗如何? 当以上因素皆有利时, 化石燃料往往能够被大量替代, 利用纤维素生产酒精即是一例。而当以上因素皆不利时, 如以谷物为原料生产聚羟基脂肪酸酯(PHA), 由于未进行秸秆回收, 该过程没有实现化石燃料的有效替代。本文提出的评估框架可在无特定产品信息的情况下运行, 进而确定生物原料和过程特性在多大程度上影响化石燃料的替代功效。而且产品信息一旦给定, 亦可方便地集成到该框架中去。

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A Product Non-Specific Framework for Evaluating the Potential of Biomass-Based Products to Displace Fossil Fuels

Lee R. Lynd and Michael Q. Wang

KEYWORDS:

bioenergy, biomass, energy balance, fossil fuels, life-cycle assessment (LCA), renewable energy

SUMMARY:

The use of biomass as a raw material for production of fuels and commodity chemicals is attracting increasing attention motivated by the possibility of positive contributions to a sustainable resource supply, enhanced national security, and macroeconomic benefits for rural communities and society at large. Fossil fuel displacement exclusive of product recovery can be estimated for biological processing of biomass in the absence of product-specific information other than the product yield and whether fermentation is aerobic or anaerobic. Based on this observation, a framework is proposed for estimating fossil fuel displacement on a per-unit-product or per-unit-biomass basis. Use of a per-unit-biomass basis offers somewhat different insights as compared to a per-unit-product basis and appears particularly appropriate for consideration of the efficacy of resource or land use. Using the proposed framework, the following feedstock and process factors are shown to be particularly important in determining the extent of fossil fuel displacement via biological processes: feedstock (corn or cellulosic) and, for corn, harvest mode (e.g., with or without stover recovery); biological conversion (aerobic or anaerobic); product yield; and the energy requirements for product recovery. When all of these factors are favorable, as in the case of the cellulosic ethanol scenario examined, significant fossil fuel displacement can be achieved. When all of these factors are unfavorable, as in the case of a scenario involving polyhydroxyalkanoate (PHA) production from corn without stover recovery, no net displacement is achieved. The proposed framework provides a means to screen processes with respect to potential for fossil fuel displacement in the absence of product-specific information, to gain general insights into feedstock and process features important in determining the extent to which fossil displacement is realized, and to rapidly incorporate product-specific information into a preexisting evaluative rubric.

《产业生态学报》

2003 年冬, 第 7 卷第 3-4 期, 33-46 页

题目: 美国农业化工与生物质原料开发的旧曲新章**作者:** Mark Finlay**关键字:** 农业应用研究, 粗酒石, 生物质产品, 国家农业化工理事会, 新用途, 合成橡胶

摘要: 美国探求可再生、生物质原料的历史十分悠久, 成败兼著。历史上的农业化工运动是现代农业“新用途”运动的前身, 它酝酿于 20 世纪 20 年代, 并正式形成于 20 世纪 30 年代中期。作为一种新兴政治力量, 农化运动为工业界和政府复兴农业经济、减少对外国工业原材料的依赖提供了途径。农业化学家们迫使美国农业部更加关注农作物综合利用的研究。这一努力被证明成效显著, 为美国二战期间的经济作出了重大贡献。本文还重点分析了战后这一美国农业化工史并不引人注目的时期, 初步探讨了农化运动沉寂下来的原因, 可以引为当前生物质材料研究的前车之鉴。

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Old Efforts at New Uses: A Brief History of Chemurgy and the American Search for Biobased Materials

Mark Finlay

KEYWORDS:

agricultural utilization research, agrol, biobased products, National Farm Chemurgic Council, new uses, synthetic rubber

SUMMARY:

The American search for biobased and renewable raw materials has a long history of intermittent success and frustration. This article traces the history of the chemurgy movement—a precursor to what are now sometimes called agricultural “new uses” initiatives—from its context of the 1920s through its emergence as a political force in the mid-1930s, when chemurgy offered a strategy for industries and governments interested in reviving the agricultural economy and reducing dependence upon foreign sources of industrial raw materials. Chemurgists put pressure upon the U.S. Department of Agriculture to devote greater attention to crop utilization research, efforts that were operational in time to make important contributions to the U.S. economy during World War II. This article devotes considerable attention to the postwar era, a period not discussed in most histories of chemurgy. The article concludes with a tentative assessment of issues that caused chemurgy to falter in the past as well as precautionary lessons for the contemporary study of biobased materials.

《产业生态学报》

2003 年冬, 第 7 第 3-4 期, 47-62 页

题目: 基于可再生原料的表面活性剂: 欧盟的相关政策措施及二氧化碳减排分析

作者: Martin Patel

关键字: 生物制品, 气候变化, 温室气体 (GHGs), 生命周期评价 (LCA), 油化学产品, 石化产品

摘要: 在欧盟委员会资助的欧洲气候变化计划的框架下, 一组科学家研究了利用更多的可再生物质作为化工原料的可行性, 并分析了相应的温室气体减排潜力。其中, 表面活性剂即为所研究的一种产品, 它既可用石化原料 (如油化表面活性剂) 亦可用可再生原料加以生产。首先假定到 2010 年为止, 欧盟的表面活性剂总产量保持稳定, 而油化表面活性剂产量将从 1998 年的约 88 万吨增至 2010 年的约 110 万吨, 净增 24%。由此表面活性剂生命周期过程的二氧化碳释放量将减少 8% (理论上最高可达 37%)。由于表面活性剂的市场需求有望增加, 实际的二氧化碳减排将超过 8%。但是与工业部门的二氧化碳排放乃至人类社会的总排放相比, 表面活性剂所导致的二氧化碳排放非常小, 仅为二者的 0.02% 和 0.09%。总的看来, 增加基于生物质的表面活性剂的生产和使用份额应该成为一个兼顾能源供需两方面的多种措施的总体战略的一部分。文中还就相关的政策措施作了讨论。

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Surfactants Based on Renewable Raw Materials: Carbon Dioxide Reduction Potential and Policies and Measures for the European Union

Martin Patel

KEYWORDS:

biobased products, climate change, greenhouse gases (GHGs), life-cycle assessment (LCA), oleochemicals, petrochemicals

SUMMARY:

Under the European Commission's European Climate Change Programme, a group of experts studied the possibilities of using more renewable raw materials as chemical feedstock and assessed the related potential for greenhouse gas (GHG) emission reduction. Surfactants were among the products studied. Surfactants are currently produced from both petrochemical feedstocks and renewable resources (oleochemical surfactants). Assuming, in a first step, that total surfactant production in the European Union remains constant until 2010, it was estimated that the amount of oleochemical surfactants could be increased from about 880 kilotons (kt) in 1998 to approximately 1,100 kt in 2010 (an increase of 24%). This substitution reduces the life-cycle CO₂ emissions from surfactants by 8%; the theoretical maximum potential for total substitution is 37%. Because the surfactant market is expected to grow, the avoided emissions will probably exceed 8% of the current life-cycle CO₂ emissions from surfactants. If compared to the CO₂ emissions from the total industrial sector and, even more so, if compared to the total economy, the relative savings are much lower (0.02% to 0.09%). This leads to the conclusion that the increased production and use of biobased surfactants should be part of an overall GHG emission reduction strategy consisting of a whole range of measures addressing both energy demand and supply. This article also discusses policies and measures designed to increase the use of biobased surfactants.

《产业生态学报》

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题目: 利用城市食品废物生产 L-多聚乳酸盐塑料的新工艺**作者:** Kenji Sakai, Masayuki Taniguchi, Shigenbou Miura, Hitomi Ohara, Toru Matsumoto, Yoshihito Shirai**关键字:** 生物可降解塑料, 生物高分子材料, 乳酸发酵, 城市食品废物, 再循环, L-多聚乳酸盐

摘要: 本文提出了一种包括发酵和生物可降解塑料(L-多聚乳酸盐, PLLA) 化工生产两阶段的新型城市食品废物再循环系统。该系统首先利用丙酸杆菌从食品废物碎屑中提取内生 D, L-乳酸; 然后 L-乳酸在半固体条件下发酵, 经过丁基酯化作用纯化, 并通过 LL-交酯聚合。整个过程保证了最大限度地生成高旋光性和旋光纯度的 PLLA, 同时循环利用了生产过程中的物料, 节省了能耗并减少了废物排放。城市食品废物中约 50% 的碳元素通过这一过程以 L-乳酸为主要形式得以回收。每 100 千克的食物废物可生成 7 千克的 PLLA (约占原始碳含量的 34%)。该过程生产的 PLLA 完全可与利用商品化 L-乳酸生产的产品在品质上相媲美。本文还从物料平衡、能量守恒和环境影响的角度对生产过程作了评价。

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Making Plastics from Garbage: A Novel Process of Poly-L-Lactate Production from Municipal Food Waste

Kenji Sakai, Masayuki Taniguchi, Shigenbou Miura, Hitomi Ohara, Toru Matsumoto and Yoshihito Shirai

KEYWORDS:

biodegradable plastic, biopolymer, lactic acid fermentation, municipal solid waste (MSW), recycling, poly-L-lactate (PLLA)

SUMMARY:

We propose a novel recycling system for municipal food waste that combines fermentation and chemical processes to produce high-quality poly-L-lactate (PLLA) biodegradable plastics. The process consists of removal of endogenous D,L-lactic acid from minced food waste by a propionibacterium, L-lactic acid fermentation under semisolid conditions, L-lactic acid purification via butyl esterification, and L-lactic acid polymerization via LL-lactide. The total design of the process enables a high yield of PLLA with high optical activity (i.e., a high proportion of optical isomers) and novel recycling of all materials produced at each step, with energy savings and minimal emissions. Approximately 50% of the total carbon was removed, mostly as L-lactic acid, and 100 kg of collected food waste yielded 7.0 kg PLLA (about 34% of the total carbon). The physical properties of the PLLA yielded in this manner were comparable to those of PLLA generated from commercially available L-lactic acid. Evaluation of the process is also discussed from the viewpoints of material and energy balances and environmental impact.

《产业生态学报》

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题目: 生命周期评价在过程设计中的应用: 以有机原料的超临界水气化为例

作者: Edgar Gasafi, Lutz Meyer, Liselotte Schebek

关键字: 面向环境的设计, 优势分析法, 氢, 影响评价, 筛选, 污泥

摘要: 本文介绍了生命周期评价方法在使用生物质材料的技术过程的设计初期的应用。目标是通过优势分析法确定过程链中造成环境影响的主要环节。在认识这些重点环节的基础上, 设计者可以有效地改进整个过程的环境表现。本文以超临界水气化这一处理高含水量的有机原料的新技术为例展开讨论。在超临界反应器中, 有机组分被转换为高热的包括氢气、甲烷和二氧化碳在内的气态混合物。评价所需的数据主要来自实验和文献, 并对缺少的数据做出一定的假设。评价分析涵盖了“从摇篮到厂门”的生命周期过程, 即利用废水处理厂的污泥用来生产氢气。评价确定了环境影响的主要来源: 气化时供热产生温室气体, 可能导致全球变暖; 脱水过程所需的掺合剂则是酸雨的主要来源; 而废水处理厂的排放是造成水体富营养化的一个重要因素。本文对相关环境影响的来源作了深入分析, 并探讨了减少环境污染的措施。

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**Using Life-Cycle Assessment in Process Design:
Supercritical Water Gasification of Organic Feedstocks**

Edgar Gasafi, Lutz Meyer and Liselotte Schebek

KEYWORDS:

design for environment (DfE), dominance analysis, hydrogen, impact assessment, screening, sewage sludge

SUMMARY:

This article presents the application of life-cycle assessment in early phases of process design in the context of technology that employs a bio-based material. The goal is to identify hot spots in the process chains with regard to environmental impacts by performing a dominance analysis. By focusing his activities on the hot spots identified, the designer is given the opportunity to efficiently improve environmental performance. This approach is illustrated for the case of supercritical water gasification, a novel technology for the treatment of organic feedstock with high moisture content. In the reactor under supercritical conditions, organic components are converted into a high-caloric synthesis gas, with hydrogen, methane, and carbon dioxide as the main products. The data used for the assessment are obtained from laboratory tests and the literature, completed by assumptions for missing data. The scope of assessment ranges from the extraction of raw materials to the product, that is, hydrogen (cradle to gate) with sewage sludge of a municipal wastewater treatment plant used as feedstock. The assessment identifies the main sources of environmental impacts. The predominant process step in terms of global warming potential is the supply of the gasification process with additional heat. The production of a blending agent in the dewatering step is the main source of the impact category of acidification, whereas the wastewater treatment plant is the origin of emissions that lead to eutrophication. The revealed sources are analyzed further and options for reducing the environmental impacts are discussed.

《产业生态学报》

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题目: 生物高分子材料和生物能源在土地利用、节能和温室气体减排方面的生命周期评价分析与系统扩展

作者: Veronika Dornburg, Iris Lewandowski, Martin Patel

关键字: 农业, 生物质, 生物高分子材料, 土地利用, 塑料, 可再生燃料

摘要: 本文通过扩展生命周期评价 (LCA) 方法, 比较了在单位农业用地的标准下, 通过生物质生产生物高分子材料和生物能源过程的节能和温室气体减排情况。鉴于目前利用生物质生产生物能源以及生物高分子材料的政策目标, 用来生产非粮食作物的土地数量就成为这两种应用的制约条件。由于能源和温室效应在当今的环境决策占有十分突出的地位, 因此有必要将土地利用体现到不同生物质利用技术的环境影响比较。过去几年中, 利用 LCA 方法评价各种生物高分子材料的研究屡见不鲜, 但关于土地利用方面的讨论为数很少。本研究发现分别以单位农业用地面积和单位生物高分子材料产量为评价基准, 不同生物质应用过程在以能耗和温室气体排放等指标反映的环境影响的排序结果不同。结果显示生产天然纤维复合材料和热塑性淀粉这两类生物高分子材料的环境影响要低于生产生物能源, 聚交酯生产过程的环境影响较大, 而聚羟基脂肪酸酯过程最差。如能将生物高分子材料生产过程中的农业废物用于再生生物能源, 将显著改善其环境表现。另外, 生物高分子材料在中期时间尺度上很可能达到较高的生产效率, 因此在土地资源有限的前提下, 这是一个不错的选择, 可以减少人类社会对不可再生资源的依赖以及温室气体的排放。

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Comparing the Land Requirements, Energy Savings, and Greenhouse Gas Emission Reduction of Biobased Polymers and Bioenergy: An Analysis and System Extension of Life Cycle Assessment Studies

Veronika Dornburg, Iris Lewandowski and Martin Patel

KEYWORDS:

agriculture, biomass, biopolymer, land use, plastics, renewable fuels

SUMMARY:

This study compares energy savings and greenhouse gas (GHG) emission reductions of biobased polymers with those of bioenergy on a per unit of agricultural land-use basis by extending existing life-cycle assessment (LCA) studies. In view of policy goals to increase the energy supply from biomass and current efforts to produce biobased polymers in bulk, the amount of available land for the production of nonfood crops could become a limitation. Hence, given the prominence of energy and greenhouse issues in current environmental policy, it is desirable to include land demand in the comparison of different biomass options. Over the past few years, numerous LCA studies have been prepared for different types of biobased polymers, but only a few of these studies address the aspect of land use. This comparison shows that referring energy savings and GHG emission reduction of biobased polymers to a unit of agricultural land, instead of to a unit of polymer produced, leads to a different ranking of options. If land use is chosen as the basis of comparison, natural fiber composites and thermoplastic starch score better than bioenergy production from energy crops, whereas polylactides score comparably well and polyhydroxyalkanoates score worse. Additionally, including the use of agricultural residues for energy purposes improves the environmental performance of biobased polymers significantly. Moreover, it is very likely that higher production efficiencies will be achieved for biobased polymers in the medium term. Biobased polymers thus offer interesting opportunities to reduce the utilization of nonrenewable energy and to contribute to GHG mitigation in view of potentially scarce land resources.

《产业生态学报》

2003 年冬, 第 7 卷第 3-4 期, 117-146 页

题目: 利用谷物秣草生产乙醇燃料的能源与环境影响分析

作者: John Sheehan, Andy Aden, Keith Paustian, Kendrick Killian, John Brenner, Marie Walsh, Richard Nelson

关键字: 农业废弃物, 生物燃料, 生物质, E85, 生命周期评价(LCA), 土壤有机碳(SOC)

摘要: 玉米秸秆是谷物收割后所残余的废物。本文通过一个生命周期模型分析了美国中西部衣阿华州利用秣草生产用于轻型车的 E85 燃料(含 85%的乙醇和 15%的汽油)的过程。该模型集成了土壤碳元素动力学、土壤腐蚀、玉米秸秆收集与运送的农业经济学以及玉米秸秆生物转化为乙醇等方面的研究成果。由于数据有限, 作者假设衣阿华州所有农民全部采用非耕方式连续种植玉米。在玉米秸秆得以最大收集的前提下, 该州一年可生产约 80 亿升的纯乙醇 E100, 且价格与传统的以淀粉为原料所生产的乙醇相当。作为衡量土质的土壤有机质指标尽管因玉米秸秆的使用在初始阶段有所下降, 但在所研究的 90 年期间基本保持稳定。衣阿华州各县的土壤浸蚀也都控制在农业部规定的要求之内。车辆同样行驶 1 公里, 使用 E85 将比使用汽油节省 95%的原油。全生命周期的化石能源(包括煤、石油和天然气)需求和温室气体排放也分别减少了 102%和 113%。该过程对空气质量的影响好坏参半, 一氧化碳、氮氧化物和硫氧化物的排放增加了, 但碳氢化合物和臭氧的排放有所减少。这一模型可用于评价玉米秸秆和其它农业废弃物的可持续开发过程, 为今后关于生物燃料的深入研究打下了基础。

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Energy and Environmental Aspects of Using Corn Stover for Fuel Ethanol

John Sheehan, Andy Aden, Keith Paustian, Kendrick Killian, John Brenner, Marie Walsh and Richard Nelson

KEYWORDS:

agricultural residues, biofuels, biomass, E85, life-cycle assessment (LCA), soil organic carbon (SOC)

SUMMARY:

Corn stover is the residue that is left behind after corn grain harvest. We have constructed a life-cycle model that describes collecting corn stover in the state of Iowa, in the Midwest of the United States, for the production and use of a fuel mixture consisting of 85% ethanol/15% gasoline (known as "E85") in a flexible-fuel light-duty vehicle. The model incorporates results from individual models for soil carbon dynamics, soil erosion, agronomics of stover collection and transport, and bioconversion of stover to ethanol. Limitations in available data forced us to focus on a scenario that assumes all farmers in the state of Iowa switch from their current cropping and tilling practices to continuous production of corn and "no-till" practices. Under these conditions, which maximize the amount of collectible stover, Iowa alone could produce almost 8 billion liters per year of pure stover-derived ethanol (E100) at prices competitive with today's corn-starch-derived fuel ethanol. Soil organic matter, an important indicator of soil health, drops slightly in the early years of stover collection but remains stable over the 90-year time frame studied. Soil erosion is controlled at levels within tolerable soil-loss limits established for each county in Iowa by the U.S. Department of Agriculture. We find that, for each kilometer fueled by the ethanol portion of E85, the vehicle uses 95% less petroleum compared to a kilometer driven in the same vehicle on gasoline. Total fossil energy use (coal, oil, and natural gas) and greenhouse gas emissions (fossil CO₂, N₂O, and CH₄) on a life-cycle basis are 102% and 113% lower, respectively. Air quality impacts are mixed, with emissions of CO, NO_x, and SO_x increasing, whereas hydrocarbon ozone precursors are reduced. This model can serve as a platform for future discussion and analysis of possible scenarios for the sustainable production of transportation fuels from corn stover and other agricultural residues.

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题目: 利用生物质生产生物质产品对能源和全球变暖的累积影响

作者: Seungdo Kim, Bruce Dale

关键字: 农业, 苜蓿, 玉米, 生命周期评价(LCA), 大豆, 柳枝稷

摘要: 本文估算了玉米、大豆、苜蓿和柳枝稷等作物从其生产到运往生物提炼厂过程对能源和全球变暖的总体环境影响。各种作物的农业投入数据取自美国的伊利诺斯、印第安纳、衣阿华、密歇根、明尼苏达、俄亥俄和威斯康星七州。研究发现生产和运输各单位农产品的能耗如下, 玉米为 1.99 至 2.66MJ/kg, 大豆为 1.98 至 2.04 兆焦/千克, 苜蓿为 1.24 兆焦/千克, 柳枝稷为 0.97 至 1.34 兆焦/千克。相关温室效应如下, 玉米为 246 至 286 gCO₂当量/kg, 大豆: 159 至 163g CO₂当量/kg, 紫花苜蓿为 89 g CO₂当量/kg, 柳枝稷为 124 至 147 g CO₂当量/kg。以上详尽的数据能够部分解决有关生物法制乙醇的能源平衡的争论, 并为对此进行的进一步的生命周期研究奠定了基础。

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Cumulative Energy and Global Warming Impact from Production of Biomass for Biobased Products

Seungdo Kim and Bruce Dale

KEYWORDS:

agriculture, alfalfa, corn, life-cycle assessment (LCA), soybeans, switchgrass

SUMMARY:

The cumulative energy and global warming impacts associated with producing corn, soybeans, alfalfa, and switchgrass and transporting these crops to a central crop processing facility (called a "biorefinery") are estimated. The agricultural inputs for each crop are collected from seven states in the United States: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. The cumulative energy requirement for producing and transporting these crops is 1.99 to 2.66 megajoules/kilogram (MJ/kg) for corn, 1.98 to 2.04 MJ/kg for soybeans, 1.24 MJ/kg for alfalfa, and 0.97 to 1.34 MJ/kg for switchgrass. The global warming impact associated with producing biomass is 246 to 286 grams (g) CO₂ equivalent/kg for corn, 159 to 163 g CO₂ equivalent/kg for soybeans, 89 g CO₂ equivalent/ kg for alfalfa, and 124 to 147 g CO₂ equivalent/kg for switchgrass. The detailed agricultural data are used to assess previous controversies over the energy balance of bioethanol and, in light of the ongoing debates on this topic, provide a needed foundation for future life-cycle assessments.

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题目: 矿物油和菜籽油用于移动液压系统的生命周期分析

作者: Marcelle C. McManus, Geoffrey P. Hammond, Clifford R. Burrows

关键字: 生物制品, 生物可降解流体, 生物润滑油, 功能单元, 机器性能, 产品使用

摘要: 近年来越来越多的移动式液压系统转而使用菜籽油做润滑油, 这主要是出于系统工作环境方面的考虑。本文以锯木机和垃圾清扫车为例, 分别考察了液压系统应用矿物油和菜籽油的主要生命周期过程。研究表明使用菜籽油并不一定更加环境友好, 事实上多数情况下菜籽油比矿物油的环境表现要差。只有温室气体排放是个例外, 由于消耗化石燃料, 矿物油的温室气体排放强度更大。本文的研究兼顾机器制造、润滑油生产及其在机器一生中的使用过程。菜籽油的环境表现不佳主要是由于其油料在系统工作环境中的品质较差、消耗较快, 不像矿物油那样耐高温和高压。这又对生命周期评价中功能单元的确定产生了一定影响。此外菜籽油比矿物油腐蚀性强, 使用菜籽油会缩短机器液压系统的寿命。

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Life-Cycle Assessment of Mineral and Rapeseed Oil in Mobile Hydraulic Systems

Marcelle C. McManus, Geoffrey P. Hammond and Clifford R. Burrows

KEYWORDS:

biobased products, biodegradable fluids, biolubricants, functional unit, machine performance, product use

SUMMARY:

The use of rapeseed oil in mobile hydraulic systems has become more widespread over recent years. This is because of concern about the environment in which the systems work and the perceived benefit of using such fluids. This article examines the major segments of the life cycle of mineral and rapeseed oil as used in mobile hydraulic systems, with case studies of a forestry harvester and a road sweeper. It shows that the systems running on rapeseed oil are not necessarily better for the environment. Many of the environmental issues examined in the study were affected more negatively by the use of rapeseed oil than mineral oil. The main exception to this was greenhouse gas emissions, which are consistently higher for systems using mineral oil because of the use of fossil resources. This study examines the production of the machinery, the oils, and their use throughout the machines' lives. The poor environmental performance of the rapeseed oil is due mainly to its poor performance in the field. This is because it does not respond as well to high pressure and temperature as mineral oil, causing it to need more frequent replacement during use. This, in turn, influences the definition of the functional unit used in the life-cycle assessment that was conducted. Also, the rapeseed oil has more corrosive qualities than the mineral oil, and more hydraulic components need replacing during the life of a machine running on rapeseed oil than one running on mineral oil.

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题目: 生物润滑油的可持续性评价

作者: Bryony Cunningham, Nigel Battersby, Walter Wehrmeyer, Catriona Fothergill

关键字: 生物润滑油, 环境指标, 液压机液体, 生命周期评价 (LCA), 壳牌全球解决方案, 可持续性评价

摘要: 壳牌全球解决方案(Shell Global Solutions)提出了一个可以反映产品环境、经济和社会影响的可持续性评价矩阵。该矩阵力求比常规的生命周期评价方法更快更省, 它重点关注产品生命周期的某些特定影响, 然后通过比较不同产品的环境影响做出评判。这种工具不仅是一般的数据分析, 而是能够更加深入地开展定性和定量评价。这种评价工具还可以包含一家企业当前想法的主观判断。经过对所有产品进行充分的试用, 外部利益相关者就可以对评价过程起决定作用的评价指标进行评估。本文描述了可持续性评价矩阵的开发经过, 并运用此工具对一种符合瑞典 SS 15 54 34 标准的生物润滑油和传统矿物润滑油作了比较。可持续性评价工具帮助壳牌公司快速做出产品开发的决策, 使其保持在可持续发展的道路上。针对具体的评价需要, 该工具还可以提供更加详尽的信息。

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A Sustainability Assessment of a Biolubricant

Bryony Cunningham, Nigel Battersby, Walter Wehrmeyer and Catriona Fothergill

KEYWORDS:

biolubricant, environmental indicators, hydraulic fluid, life-cycle assessment (LCA), Shell Global Solutions, sustainability assessment

SUMMARY:

A sustainability matrix has been developed at Shell Global Solutions to show the environmental, social, and economic impacts of a product. The approach aims to be quicker and more cost-effective than a conventional life-cycle assessment by focusing on specific areas of concern through the product life cycle and then comparing products by scaling their impacts relative to one another. It provides a way of making qualitative and quantitative assessment that gives a depth to the assessment beyond data analysis. The tool includes subjective judgment, which tends to reflect current thinking in the company. Once the tool has been fully tested on all product types, the indicators that are central to the process will be assessed by external stakeholders. This article describes the development of the sustainability assessment tool and presents an example that compares the sustainability of a biolubricant (an "environmentally acceptable" hydraulic fluid meeting Swedish Standard SS 15 54 34) with that of a conventional mineral-oil-based product. The tool provides a quick decision-making instrument to help Shell decide which products should be marketed for the business to continue on a sustainable path. The tool also provides a more detailed level of information if a more thorough assessment is necessary.

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题目: 美国联邦政府支持生物质研究与开发行动的综述

作者: Marvin Duncan

关键字: 农业, 生物质产品, 生物燃料, 生物质发电, 政府投入, 新用途

摘要: 本文综述了美国联邦政府支持生物质研究、示范和开发的情况。生物质发电、生物燃料、生物质产品的产销总称为“生物质产业”, 它的快速发展得到了美国工业界和政府的双重推动。联邦政府和国会在这—领域内的领导和促进作用有案可查。本文对有关生物质发电、生物燃料和生物质产品的五个主要促进政策作了讨论, 并简要介绍了美国目前对生物质资源的利用情况。本文还介绍了在当前财年中美国农业部和能源部这两个主导生物质产业的研发活动的政府机构对生物质利用研发的经费投入情况, 以及该项资金在美国联邦科研经费投入中的比例。最后, 本文建议了几个生物质产业的未来市场切入点, 强调了支撑生物质产业发展的基础设施建设的重要性, 指出这种建设将会对农民、农村、林业工人和环境产生的回报。

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U.S. Federal Initiatives to Support Biomass Research and Development

Marvin Duncan

KEYWORDS:

agriculture, biobased products, biofuels, biopower, government funding, new uses

SUMMARY:

This article provides a brief overview of federal initiatives in the United States to support biomass research, demonstration, and development. The interest in the biomass industry and U.S. federal efforts to spur development of, increased production of, and use of biopower, biofuels, and biobased products, collectively known as the “biomass industry,” are discussed. A growing level of leadership from the executive branch of the federal government and support by the U.S. Congress are documented. Five important policy drivers that support this heightened emphasis on biomass for power, fuels, and products are identified and discussed. The current status of U.S. dependence on these renewable energy sources is briefly outlined. Federal biomass funding activity for the current fiscal year by the U.S. Department of Agriculture and the U.S. Department of Energy, two major federal participants in research, demonstration, and development for this industry, is briefly outlined. This funding commitment is placed into an overall context of total federal support for all research and development. Finally, the article suggests future market penetration targets for this industry, emphasizes the importance of infrastructure development necessary to support the industry’s growth, and notes the payoff from such development for farmers, foresters, rural communities, and the environment.