Life Cycle Associates

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California Air Resources Board
Richard Corey
Executive Officer

Reference: **Comments on Ethanol Denaturant Blending**

Dear Mr. Corey,

Life Cycle Associates would like to take this opportunity to provide comments on the calculation of the carbon intensity (CI) for denaturant corn oil biodiesel (COB) based on ethanol production with wet DGS. The pathway approach appears to be a significant improvement over the COB pathway for ethanol with dry DGS published by ARB on January 28, 2011. I am attaching a copy of my comments to that pathway for reference. The prior dry DGS pathway leveraged the energy savings from corn ethanol onto COB. Sales of ethanol to California with these energy savings were not required by ARB thus creating a golden gallon with low CI and high price premium but not net benefit to the environment. Transferring the energy savings to COB created accounting problems.

Several aspects of the September 8, 2014 Version 1 pathway would lead to a better document and more accurate accounting of emissions. These include:

Page 3, System Boundary Diagram. The SBD is not appropriate. It should show the COB system. The reference system should be shown in a separate diagram. For example, wet DGS is part of the reference system as well as COB production. Also, the SBD does not show the glycerin co-product. The bottom of Table 7 shows that the emissions are allocated to glycerin and corn oil. Methanol and other inputs for biodiesel are not shown but it is well understood that these are inputs for biodiesel production.

Page 4. Allocation Discussion. The discussion could be improved by better following the ISO 14040 language in describing allocation. Primacy of products is not a leading method in determining allocation methods. However, the tail wagging the dog argument is a reasonable argument. The approach follows the substitution method. The COB system is incremental to the reference system. Also, the pathway document vaguely mentions the effect on DGS shown on Table 1. Should corn oil be treated as a residue or a diversion of a portion of the DGS mass with its more complex LCA? The indirect LUC impacts of diverting DGS to COB do not appear to be included in the analysis. Since the LUC analysis is in flux, the pathway document could provide the mathematical relationship for including the LUC impact.

Page 5. Glycerin Co-product. The CI for biodiesel transesterification is 4.89 g CO_2e/MJ soy oil BD in the December 14, 2009 Version 3 soy biodiesel pathway document. The published pathway document for COB shows 4.97 CO_2e/MJ COB. The numbers are quite similar. The differences are worth noting. Perhaps there is a rounding error or mathematical error.

Page 7, Table 2. Showing the specific energy inputs for the BD system in Btu/gallon corn oil and Btu electric per gallon of corn oil would be a more GREET like calculation. These energy inputs could then be treated like any other vegetable oil in GREET.

Page B-3, Explanation by numerical example. ARB could save substantial time by describing the array multiplications and emission factor arrays rather than showing the calculations for every pollutant.

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In summary, this wet DGS pathway is an improvement over the COB pathway. ARB should add LUC emissions for corn oil removed from DGS. Furthermore, the pathway for wet DGS is appropriate for all types of ethanol production. The energy inputs for corn oil recovery do not change. ARB should revise the COB from dry DGS ethanol to the value in the final pathway under consideration.

Thank you for considering my comments.

Best Regards,

Stefan Unnasch
Managing Director
Life Cycle Associates, LLC