January 2009 NOPA TESH Committee Recommendations to USB
on National Renewable Energy Laboratory (NREL) Database

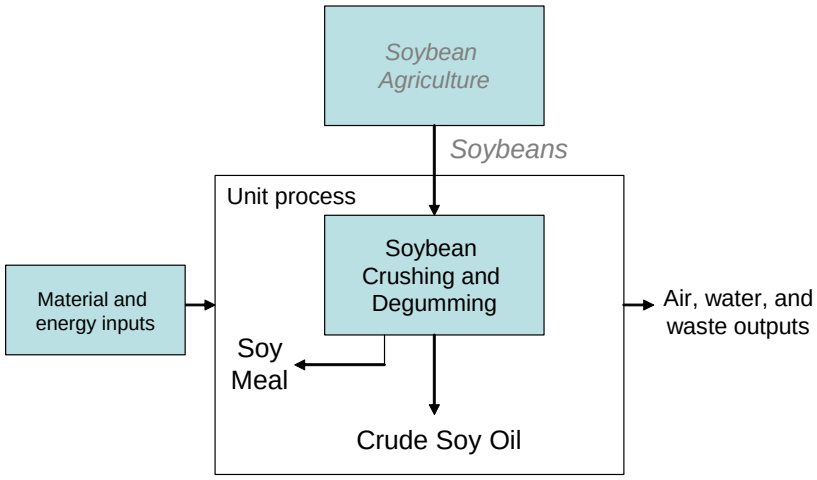
Soybean Processing to Produce Soy Crude Oil and Meal

The data for soybean processing were collected and aggregated by the National Oilseed Processors Association (NOPA).[1] To the degree possible, NOPA has provided updated data for specific energy and material "inputs" and "outputs" set forth in a May 1998 Final Report issued by the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) entitled "Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus."

The data in the 1998 Report were obtained from a single soybean processing plant. These data were not representative of either other individual soybean processing plants or the soybean processing industry as a whole.

On the other hand, NOPA's data, which it obtained by surveying its 15 member companies in mid-December 2008 for data reflective of each company's most recent fiscal year, do not reflect the performance of any single soybean processing plant. Rather, the data reflect company-supplied data that NOPA received on 50 of the 60 soybean processing plants that it represents, and are broadly reflective of energy and material inputs and outputs for soybean processing plants similar in general design and processes to the plant that was evaluated in the 1998 Report. The data that NOPA received were provided as full-facility inputs and outputs on a per-soybean input basis, and cover soybean processing via solvent extraction through crude oil degumming.

Figure 1 Soybean Crushing and Extraction Process



[1] David Ailor, Vice President of Regulatory Affairs for the National Oilseed Processors Association, Washington, D.C., provided the aggregated data in January 2009, following a data collection effort that he undertook in December 2008 and January 2009 via NOPA's "Technical and Research, Environmental, Security, and Safety, Health & Loss Prevention" (TESH) Committee.

The updated soybean processing data, as well as the previous data from the biodiesel study, are summarized in the table below.

Table 1 Soybean Processing Updated Data (per 1000 kg Oil)

Inputs	Biodiesel Study	NOPA Updates	Notes
Energy inputs			
Electricity (kWh)	410	289	
Natural Gas (kcal)	1,569,000	---	
Steam (kcal)	1,296,000		
% NG (NOPA)	---	65%	Fuel types were not broken down this specifically in Biodiesel study
% #2 FO (NOPA)	---	0.5%	
% #6 FO (NOPA)	---	1%	
% Coal (NOPA)	---	32%	
% Biomass (NOPA)	---	1%	
% LF gas (NOPA)	---	0.5%	
Total kcal of heat	*2,865,000*	*1,502,729*	NOPA data do not include data from six plants that do not produce steam onsite.
Material inputs			
Soybeans (kg)	5,891	5,236	NOPA note: 1000 bushels of soybeans
Hexane (kg)	11.9	2.96	See **note 1** below.
Water (kg)	19.4	2,547	See **note 2** below.
Outputs			
Products (kg)			
Soy Meal Produced (% by mass)	4,478 (82%)	4,131 (80.5%)	Based on five-year (2003-2007) average yields that NOPA has provided to USDA.
Soybean Oil Produced (% by mass)	1000 (18%)	1000 (19.5%)	
Air Emissions (kg)			
Hexane	10.15	2.96	See **note 1** below.
Water Effluents (kg)			
Water	453	1,383	For NOPA: the difference between the water input and output is primarily evaporation losses.
Fats, oils, and grease	5.0	<0.14	
Triglycerides	4.9	---	Not broken out by NOPA
Unsaponifiable Matter	0.08	---	
Free Fatty Acids	0.04	---	
Nonhaz. solid waste (kg)	46	8.7	

Note 1: NOPA's hexane input and air emissions numbers are based on EPA's Vegetable Oil MACT limit of 0.2 gallon of hexane lost/ton of soybeans processed with an assumed specific gravity of hexane of 5.65 pounds/gallon. The MACT limit is a "total loss" limit that reflects total hexane disappearance, the vast majority of which is via air emissions.

Note 2: NOPA data reflect individual facility metered water use, which includes water used in cooling towers, steam production, and other process-related equipment. NOPA believes that the reported water use in the Biodiesel study is erroneous, since NOPA members used metered readings to report their water use, and the Biodiesel study's water input (19 kg) to effluent (453 kg) numbers do not balance, even if factoring in evaporation losses. It is simply not clear how these numbers were determined, or what had been included in the water usage system boundaries for the facility.