



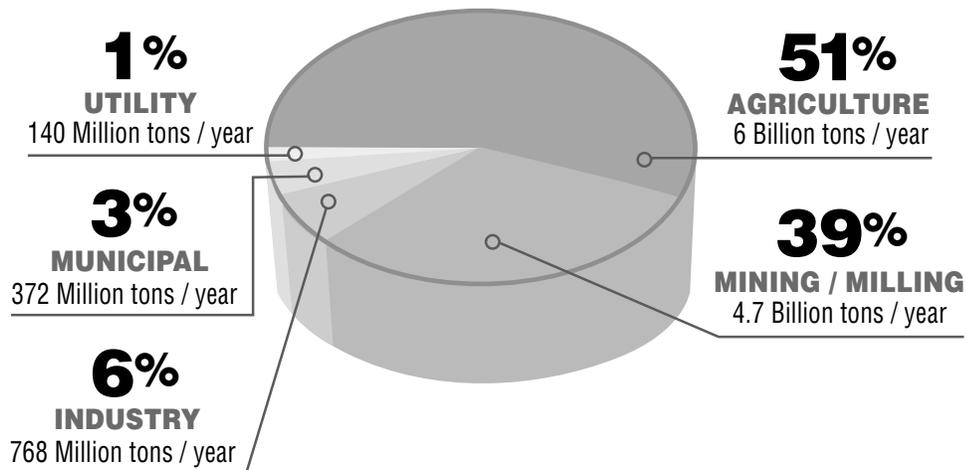
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## BIOREMEDIATION OF SOLID WASTE

Distribution of Solid Waste in the United States<sup>1</sup>



### TCP Feedstocks

- *Agricultural*  
Plant or animal waste including cellulosic material; poultry, hog or cattle offal; bones; litter, grease and manure.
- *Industry*  
Tires, plastics, PCB's, incinerator ash, paper (black liquor), metals, chemicals and petroleum products (heavy crude oil, coal, shale and tar sands, coal tars, and asphaltine residues).
- *Municipal*  
Food waste, paper, plastics and others.

<sup>1</sup> Gas Research Institute and American Gas Association, "Solid Waste Management," June 1996.

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## TCP End Products

### Hydrocarbon Oils

High value crude oil, including light oil (naphtha) and fuel oil (#2-4), which can be sold to refineries, fuel blenders or power utilities.

### Natural Gas

Fuel gas comprised of methane, propane and butane, containing sufficient BTUs to fire turbines or boilers to generate electricity or thermal energy.

### Fatty Acid Oils

Carboxylic acids including palmitic, stearic and oleic, used in manufacturing of detergents and soaps, cleaners, stabilizers, lubricants, pharmaceuticals, personal care products, and rubber products among others.

### Carbon

For use as a filter (wastewater cleanup), fuel source (substitute coal) or high-value organic fertilizer.

### Minerals

For use as a high-value fertilizer to rebalance macronutrients and replace depleted micronutrients in the soil.

Oil By-Product	End Product	Uses	Typical Output - Crude Oil (approx. % per barrel)	Typical Output - TCP (approx. % per barrel)
Liquefied Petroleum Gas (LPG)	Ethane Propane Butane	Heating, cooking Chemical feedstocks Motor gasoline Blending	10%	5%
<b>Light Ends</b>	<b>Naphthas Gasolines</b>	<b>Petrochemical feedstocks Reforming into gasoline Automotive oil</b>	<b>35%</b>	<b>60%</b>
Middle Distillates	Jet Kerosene Diesel Heating/Gasoil Vacuum/Gasoil	Aviation fuel Automotive fuel Domestic heating fuel Distilled to lighter product	35%	35%
Residual Fuel Oil	Cracked Fuel Oil Straight-Run Fuel Oil Asphalt Bitumens Coke Sulfur	Power generation Ship fuel Fuel oil Road surfacing Roofing Manufacturing of steel Chemical industry	20%	0%

## Other applications under testing

- Coal
- Coal fines
- Drilling muds
- Decanted oil slurry
- Vacuum residuals
- Infectious medical waste
- Sewage sludge
- Tires
- Plastics

