

# From Trash to Treasure: Landfill Gas Assistance in the Production of Ethanol

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# Agenda

- Ethanol Overview
- What is Landfill Gas?
- Abengoa Bioenergy Corp. – Colwich Facility
- Brooks Landfill
- Landfill Gas Collection System
- Environmental Impact
- Economic Impact
- References
- Questions?

## Ethanol Overview

- 174 million gallons in 1980 to more than 3.9 billion gallons in 2005
- Current capacity is more than 6.2 billion gallons
- Total capacity including plants under construction or expansion is more than 12.5 billion gallons
- Abengoa Bioenergy Corp. Colwich Facility expanded in 2003 to 25 million gallons per year

## Ethanol Overview

- Production in 2006: more than 4.9 billion gallons
- Average yield has increased to about 2.8 gallons per bushel of grain
- For every barrel of ethanol 1.2 barrels of petroleum is displaced
- Studies show ethanol produces up to 77% more energy than required to make it

## What is Landfill Gas?

- Landfill gas (LFG) is the natural byproduct of anaerobic decomposition of organic material placed in landfill.
- LFG:
  - ~ 50% methane (CH<sub>4</sub>).
  - ~ 50% carbon dioxide (CO<sub>2</sub>).
  - <1% non-methane organic compounds (NMOCs).
- Over 20 more stronger than CO<sub>2</sub>
- If uncontrolled, LFG contributes to smog and global warming, and may cause health and safety concerns.

## What is Landfill Gas?

- Can be collected and used as a renewable energy source for the production of electricity and/or as a fuel.
- For every 1 million tons of Municipal Solid Waste (MSW):
  - ~ 800,000 watts of electricity
  - ~ 432,000 cubic feet per day of landfill gas.
- Landfill Methane Outreach program born in 1994

## Colwich Facility

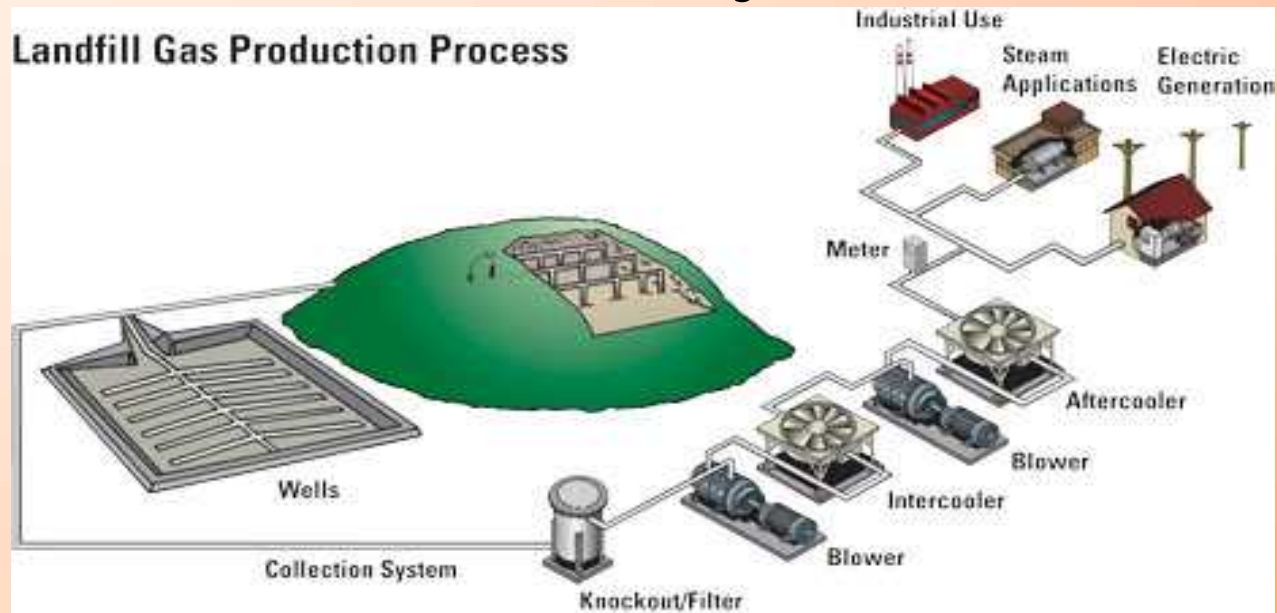
- Ethanol Production: 25 million gallons per year
- Boiler: Water tube CB DL-94 with dual-gas burner
- Steam needs: ~ 80k lb/hr steam
- Heat input: 100 MMbtu/hr
- Landfill gas usage 2:1 to natural gas

## Brooks Landfill

- 420 acre landfill now closed for most waste; operated by the City of Wichita since 1966
- Gas recovery as much as 4 million cubic feet per day
- Estimated 10-15 years of production remaining



## Landfill Gas Collection System



- DTE Biomass Energy operates the system since 1998
- 131 PVC wells over 250 acres operated
- LFG drawn from wells under vacuum
- Landfill gas travels via 16" HDPE pipeline from Brooks landfill about 11 miles southeast
- Delivery Pressure: 18 psi

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# Environmental Impacts

- Destroys methane and other organic compounds in LFG
- Offsets use of nonrenewable resources (coal, oil, gas) and reduces their emissions
- Improves safety by reducing explosion hazards in or near the landfill

# Environmental Impacts

## Colwich Ethanol Facility Utilization of LFG (3.7 mmscfd)

- Methane emissions reduced by 14,282 tons per year
- 35,317 tons of carbon dioxide reduced by avoiding the use of fossil fuels
- Total emissions reduced equivalent to:
  - ✓ Removing 58,812 vehicles
  - ✓ Planting 83,807 acres of forest
  - ✓ Displacing the use of 33.5 millions gallons of gasoline
  - ✓ Preventing the use of 713,253 barrels of oil

# Economic Impacts

- Benefits Local Economies
  - ✓ Create jobs
  - ✓ Cost savings to businesses
  - ✓ Supplies innovative ways to help out communities
- Reduces Environmental Compliance Costs
  - ✓ Turns pollution into valuable resource by offering options

## Economic Impacts

Colwich Ethanol Facility Utilization of LFG (3.7 mmscfd or about 13.1 billion cubic feet per year)

- Initial Cost of Project: \$5.5 million
- Initial Savings: \$500,000 per year by not using natural gas
- Current Savings: \$1.4 million per year due to high cost of natural gas

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### References

- Kansas AIRlines Volume 8, Number 1, July 2001
- [www.epa.com/lmop](http://www.epa.com/lmop)
- [www.wichita.gov](http://www.wichita.gov)
- [www.ethanol.org](http://www.ethanol.org)
- [www.dtebe.com](http://www.dtebe.com)

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