



Tidelands Oil Production Company

**Methane Reduction Actions
in Urban Operations**

**EPA's Natural Gas STAR
Workshop**

Houston, TX

October 23, 2007

Mark Shemaria

Replaced Old Gas Stretford Processing facility with Sulfa Treat System

Issue: Inefficient processing facility for changes in gas production.

Answer: Replace with Sulfa Treat System, for current and project gas production.

Replaced Old Gas Stretford Processing facility with Sulfa Treat System

- What did we do: Shut-in 11 “1920s” vintage ICEs
- Benefit: Removed old engines with inefficient combustion process that had a high blow-by of un-combusted fuel. (>100 tons/year);
- Technical Issues: New process and how do we manage the gas at the new facilities;
- Additional Benefits: Provided clean, efficient and reliable system



994
WEST

994
EAST

17/08/2007

Consolidate Tank Facilities



Issue: Neighboring facilities were now under common ownership, duplication of facilities existed.

Answer: Consolidate facilities accordingly for current and project production needs.

Consolidate Tank Facilities



- What did we do: Combined production at 7 tank facilities into 2;
- Benefit: Eliminated over 80 processing tanks and associated equipment containing Methane;

Consolidate Tank Facilities



- Technical issues: How do we get the production there and accommodate unique production issues (hot fluids from steam fluid);
- Additional Benefits: Reductions in staffing needed to run facilities and reduction in maintenance, reduced other liabilities.

Consolidated and Electrified hydraulic pump operations



Issue: Multiple small (50 –120 bhp) old internal combustion engines driving power oil pumps;

Answer: Replace with electric motors

Consolidated and Electrified hydraulic pump operations

- What did we do: Reduced over 30 ICE powered Kobe hydraulic pumps to 12 electric motor powered units;
- Benefits: Removed old engines with inefficient combustion process that had a high blow-by of un-combusted fuel.

Consolidated and Electrified hydraulic pump operations

- Technical Issues: How do you make best use of existing equipment;
- Additional Benefits: Reductions in staffing needed to run facilities and reduction in maintenance, reduced other liabilities.



11/04/2007

Installation of Molecular Gate[®] CO₂ Removal system.

Issue: Desire to take non-merchantable gas and make utility spec gas instead of flaring gas.

Answer: Install Acid Gas Removal system.

Installation of Molecular Gate[®] CO₂ Removal system.

- What did we do: Installed Molecular Gate CO₂ Removal system;
- Benefits: Created merchantable gas instead of flaring;
- Technical issues: New technology: 1st Commercial unit to be installed in the world;
- Additional Benefits: Increase in revenue.



Molecular Gate™ Technology for Tidelands Oil Production Company

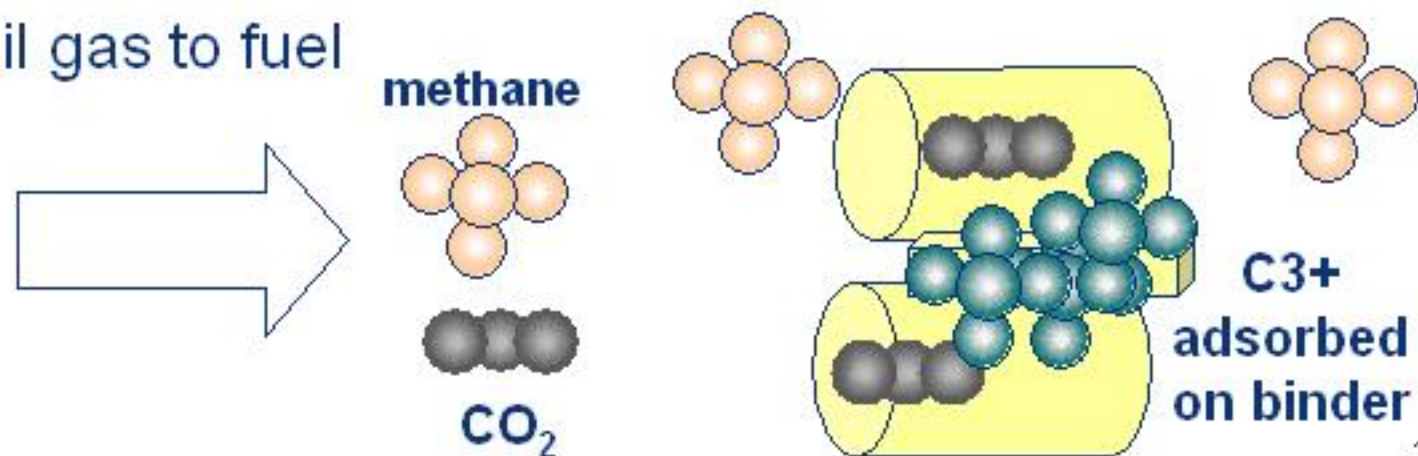
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Mike Mitariten – Guild Associates, Inc.

Methane Recovery - Molecular Gate[®]

CO₂ Removal

- 🔥 Adsorbs acid gas (CO₂ and H₂S) in fixed bed
- 🔥 Molecular sieve application selectively adsorbs acid gas molecules of smaller diameter than methane
- 🔥 Bed regenerated by depressuring
 - 🔥 ~10% of feed methane lost in “tail gas” depressuring
 - 🔥 Route tail gas to fuel



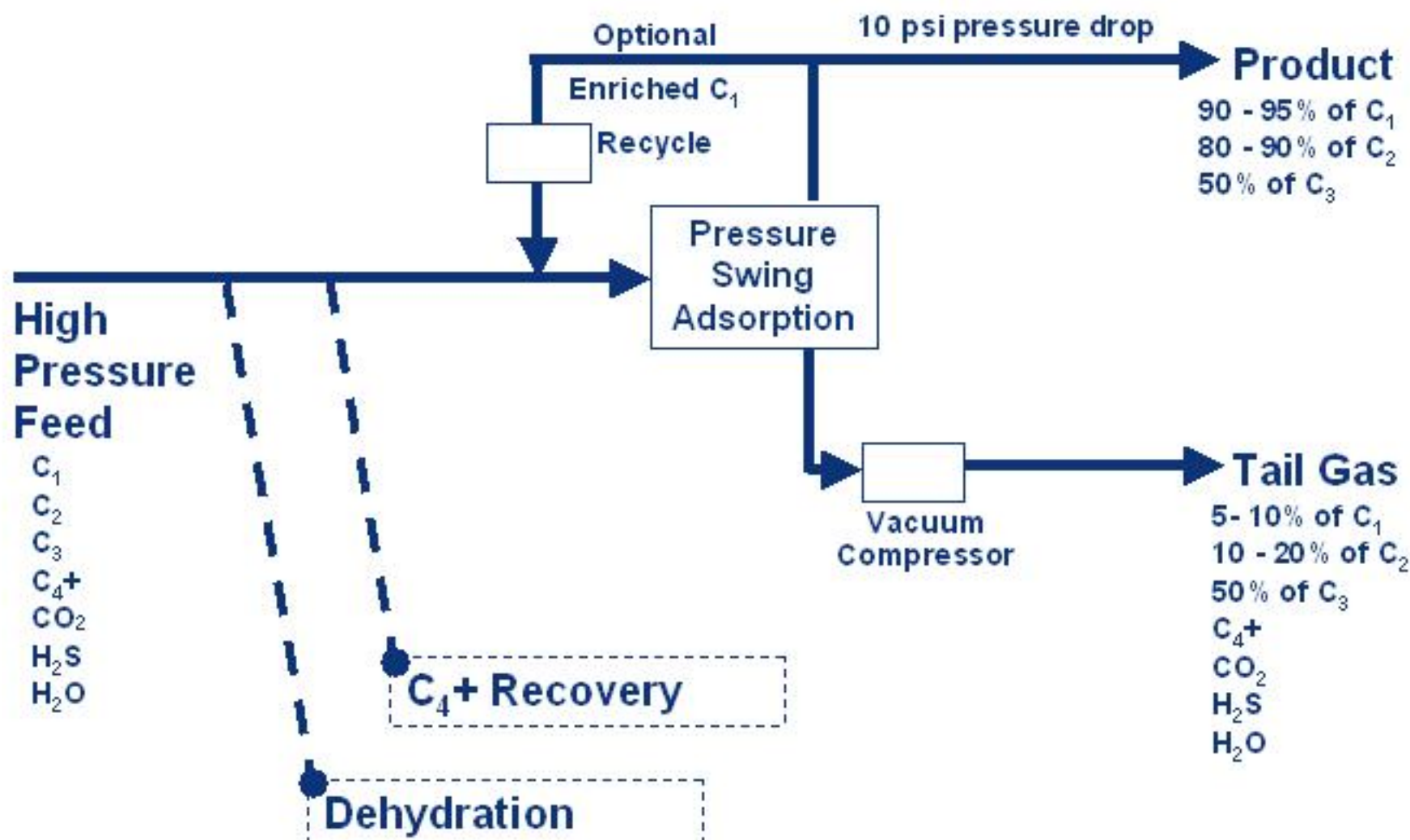
Molecular Gate[®] Applicability

- 🔥 Lean gas
 - 💧 Gas wells, Coal bed methane
- 🔥 Associated gas
 - 💧 Tidelands Oil Production Company
 - 🔥 1.4 MMcf/day
 - 🔥 18% to 40% CO₂
 - 🔥 Water saturated, rich gas
 - 💧 Design options for C₄+ in tail gas stream
 - 🔥 Heavy hydrocarbon recovery before Molecular Gate[®]
 - 🔥 Recover heavies from tail gas in adsorber bed
 - 🔥 Use as fuel for process equipment



Coal Bed Methane System in Illinois
www.moleculargate.com

Molecular Gate[®] CO₂ Removal



Industry Experience - Tidelands Molecular Gate[®] Unit

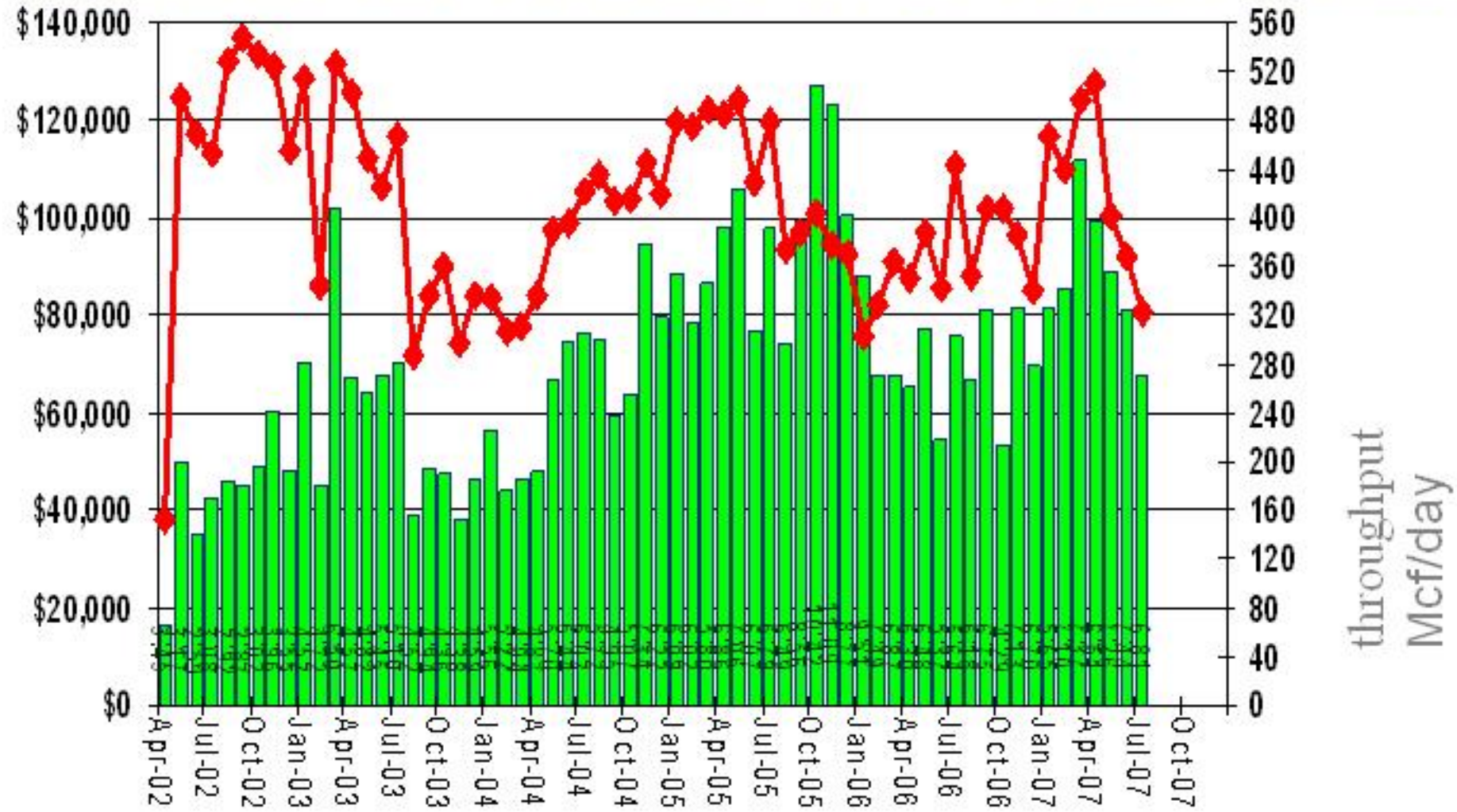
- 🔥 First commercial unit started in May 2002
- 🔥 Process up to 1.4 MMcf/day
- 🔥 No glycol system is required
- 🔥 Heavy hydrocarbons and water removed with CO₂
- 🔥 Tail gas used for fuel is a key optimization: No process venting
- 🔥 18% to 40% CO₂ removed to pipeline specifications (2%)
- 🔥 Eliminated flaring



Molecular Gate Performance at Tidelands

	Design Feed	Actual Feed	Design Product	Actual Product
Flow, MM SCFD	1.0	1.4	0.52	0.54
Pressure, psig	65	70	63	68
Temperature, F	60-80	60-80	60-80	60-80
Composition, Mol %				
C1	71.25	48.35	95.09	94.17
O2	400 ppm	800 ppm	700 ppm	1500 ppm
N2	2.18	1.34	3.74	2.40
CO2	18.82	37.58	0.19	1.90
C2	2.35	2.96	0.90	0.68
C3	2.12	3.77	0.20	0.03
C4	1.75	3.11	-	-
C5	0.76	1.40	-	-
C6+	0.72	1.41	-	-
H2O	Saturated	Saturated	-	-

Tidelands Gas Revenue & Associated Volume



■ Gas Revenue
 ◆ Gas Volume
 Gas Price (\$/Million British Thermal Unit)

Is Recovery Profitable?

- 🔥 Molecular Gate[®] costs are 20% less than amine process
 - 🔥 9 to 35 ¢ / Mcf product depending on scale
- 🔥 Fixed-bed tail gas vent can be used as supplemental fuel
 - 🔥 Eliminates venting from acid gas removal
- 🔥 Other Benefits
 - 🔥 Allows wells with high acid gas content to produce (alternative is shut-in)
 - 🔥 Can dehydrate and remove acid gas to pipeline specs in one step
 - 🔥 Less operator attention

Other Molecular Gate Applications

- 🔥 Nitrogen removal from natural gas
- 🔥 Dew Point control by heavy hydrocarbon and water removal
- 🔥 Removal of C₂ (<6%), C₃₊ (<3%) and C₆₊ (<0.2%) for CARB CNG
- 🔥 Removal of heavy hydrocarbons from CO₂ in amine plant vents to eliminate flaring



Tidelands 
Natural Gas
EPA POLLUTION PREVENTER

CO₂ Removal System

1.4 MM SCFD

38% CO₂
Removed to <2%

Start-up May 2002

Use of Ultra Efficient ICEs



Issue: Desire to use non-merchantable gas, instead of flaring gas, to run ICEs instead of electric motors.

Answer: Install large ICEs capable of using gas to drive water injection pumps.

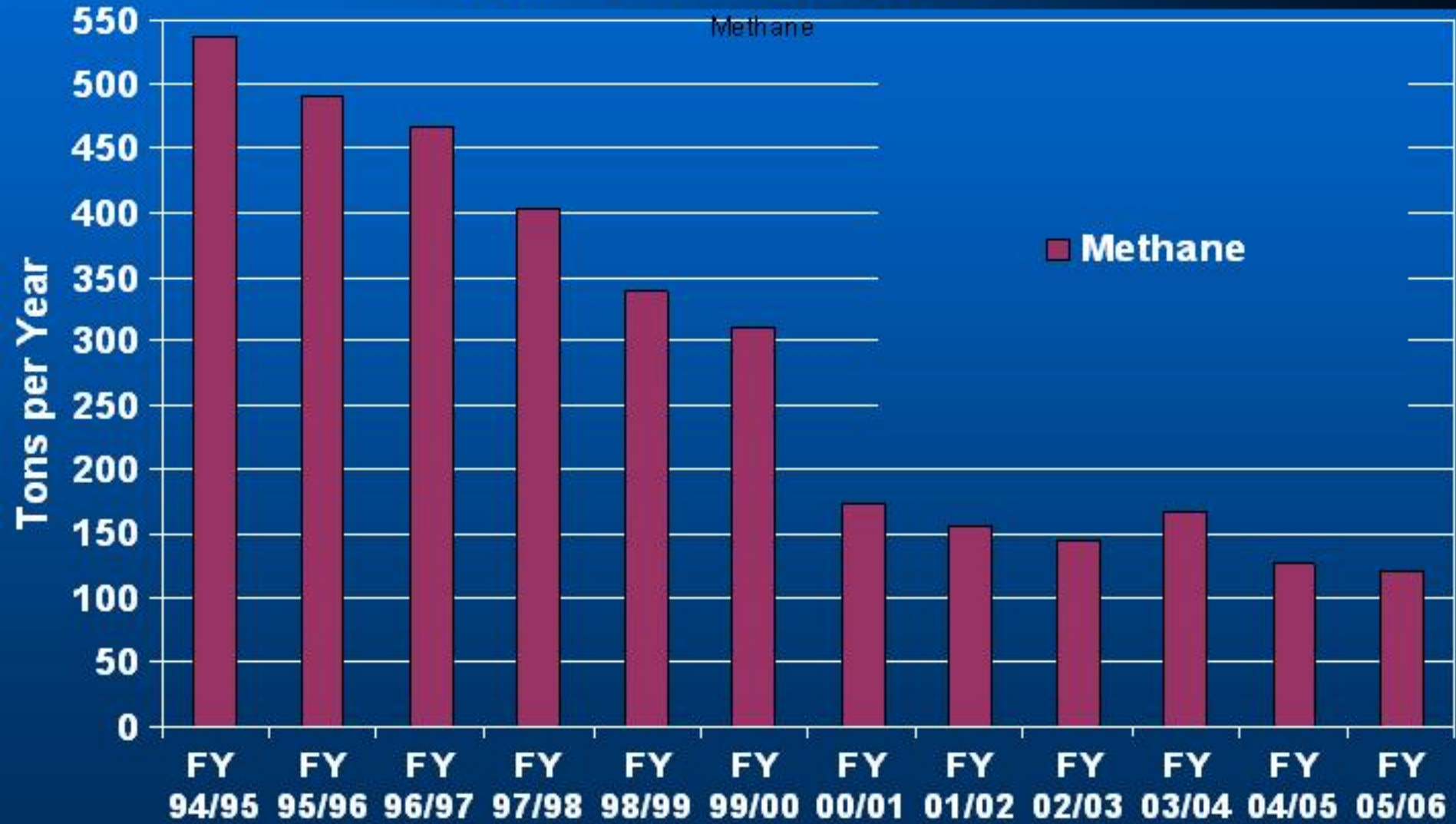
Use of Ultra Efficient ICEs

- What did we do: Designed ICEs to allowed the use of non-merchantable gas to be used as fuel.
- Benefits: Significantly reduced flaring (800 mscf/day)
- Technical Issues: How do you control emissions with varying quality gas;
- Additional Benefits: Reduction in electrical cost (\$3,000/day/unit)



13/08/2007

Air Emissions



Methane is higher in FY03/04 because SCAQMD changed method for calculating methane emissions.