

Fugitive Emissions Equals Fugitive Dollars

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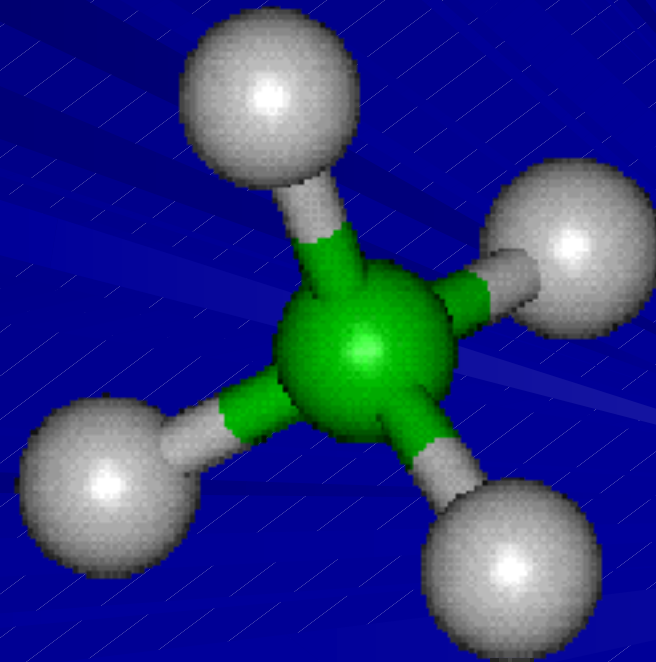
**Texas A&M University
Corpus Christi**



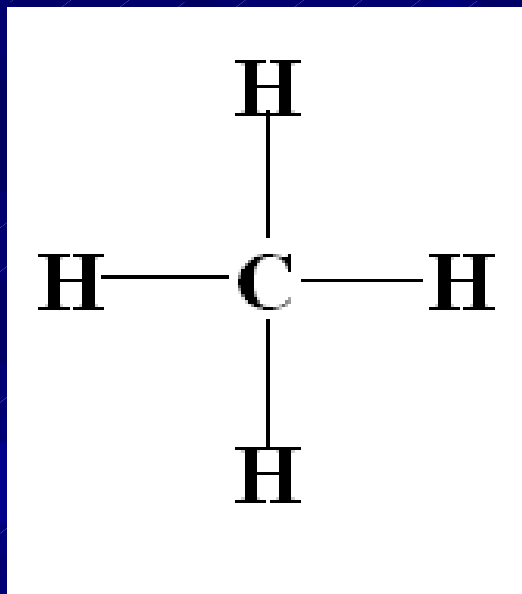
The Island University

Methane

CH₄

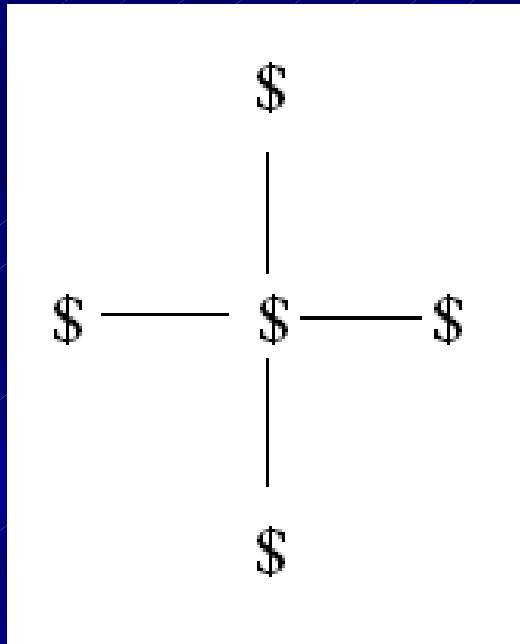


Methane



Lewis Diagram

Methane

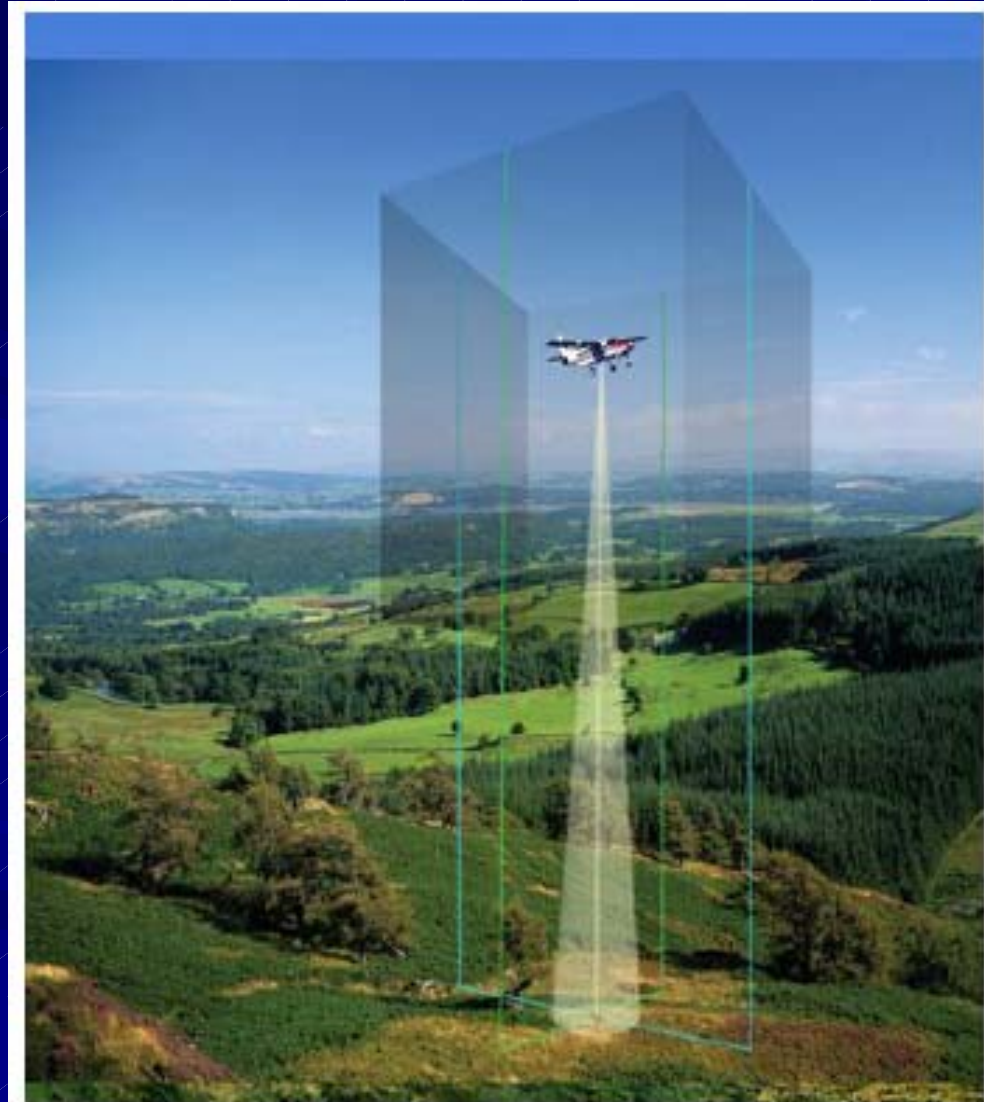


Citi Bank Diagram

Passive Detection

Liquid Storage
Tank Leaks

Active Detection



Over-Flight



Site Location

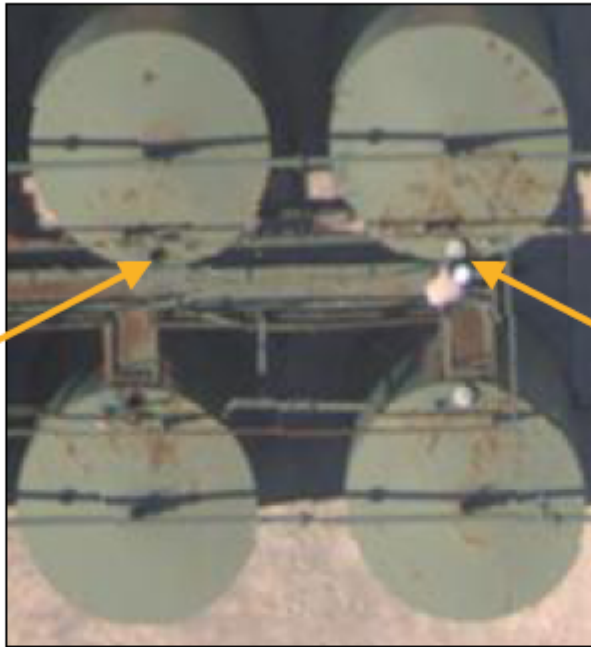
South of
Kingsville, TX



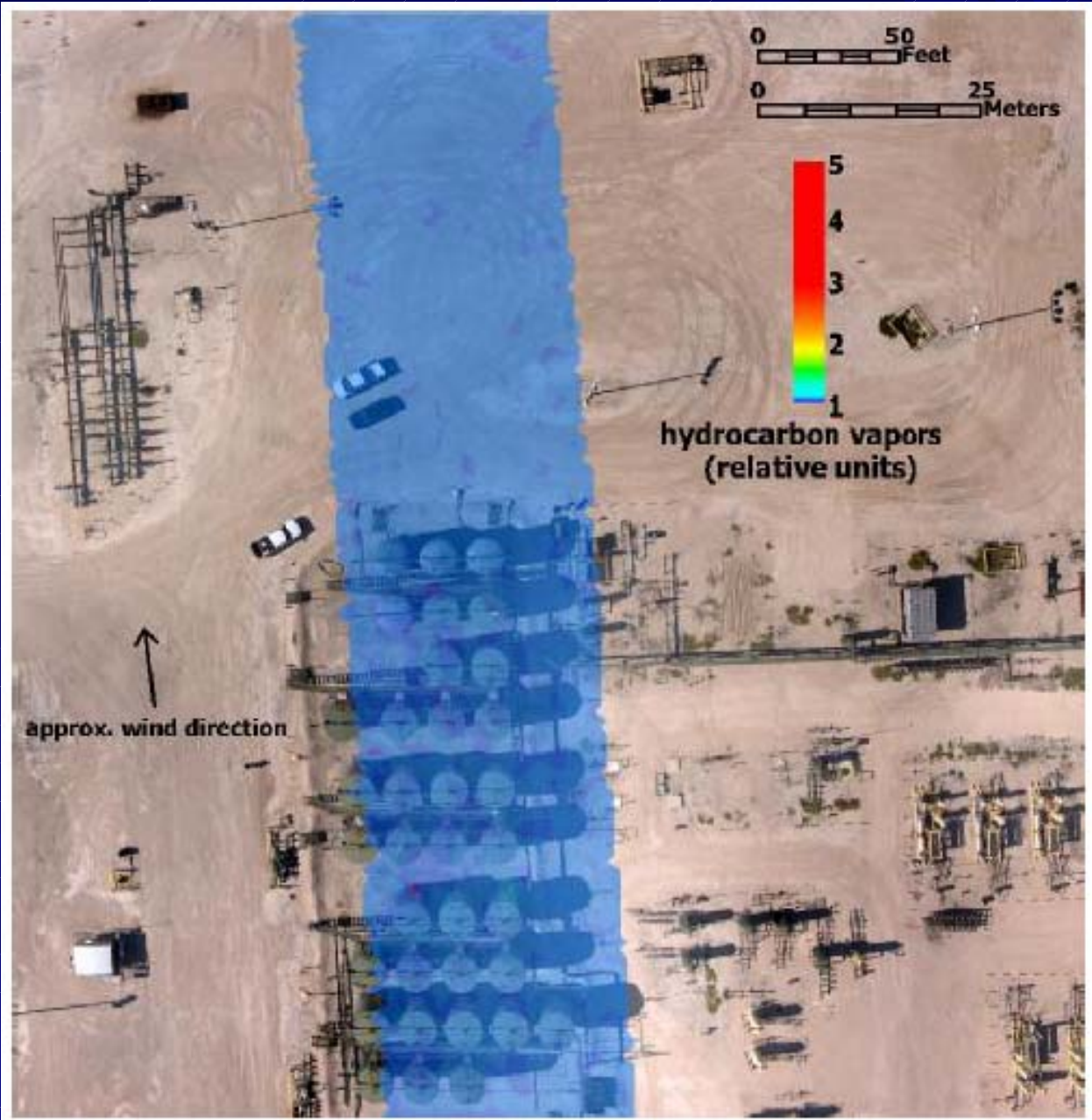
Two Passes



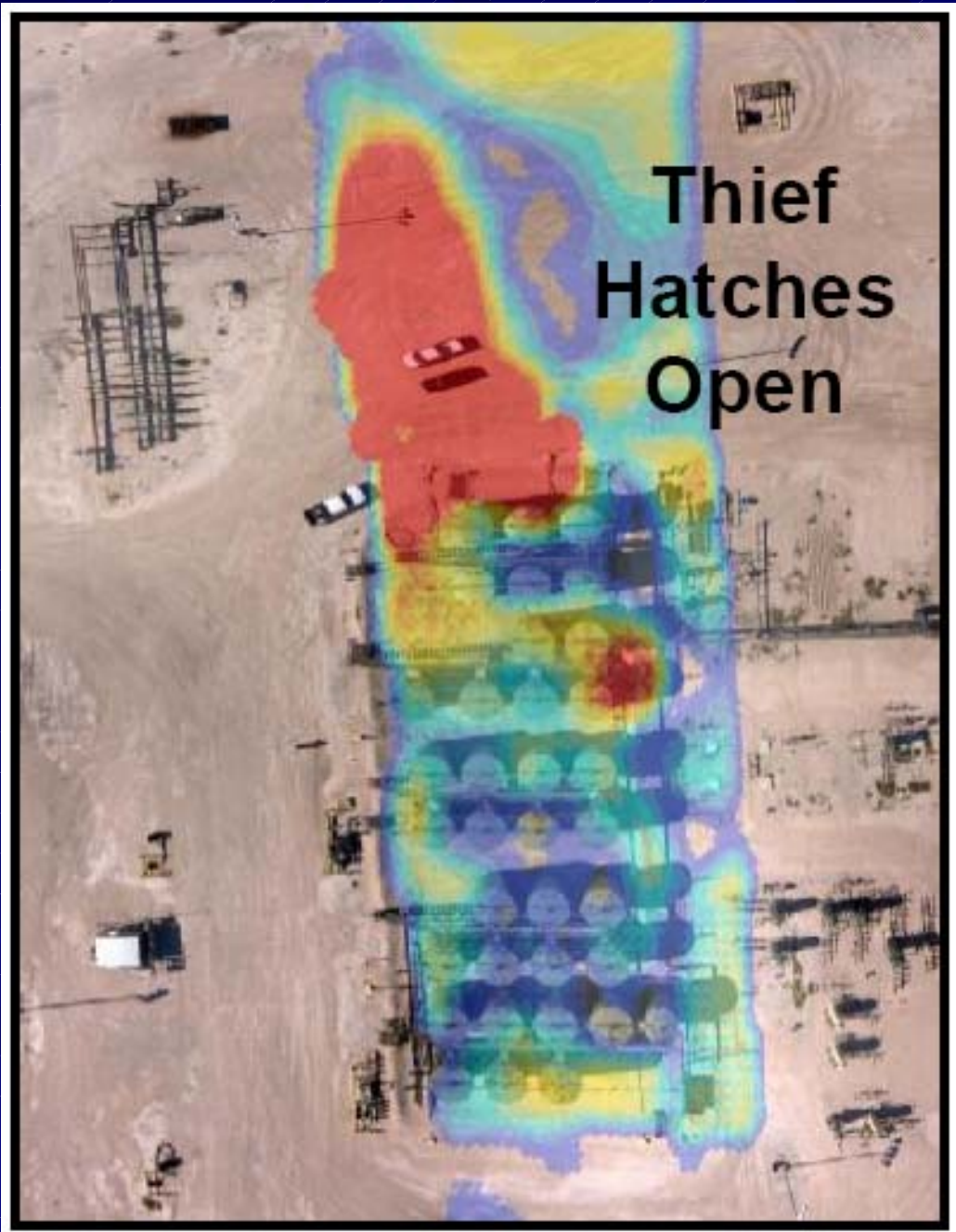
Thief Hatch
Opened



Thief Hatch
Closed



First Pass VRU Turned On



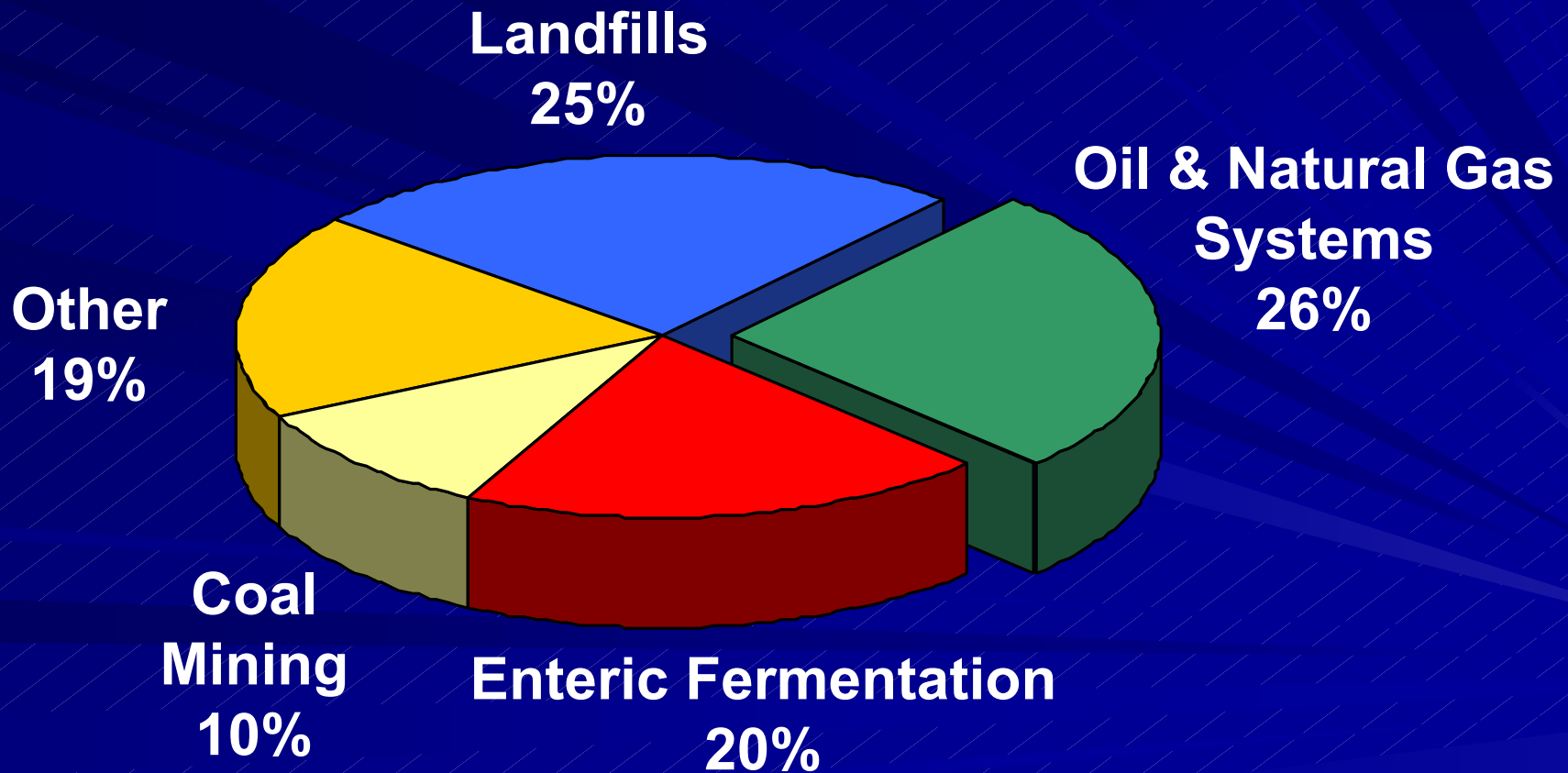
Second Pass
VRU Turned Off

Point Source



How much is lost?

The production sector accounts for 44% of the CH₄ emissions in the oil and gas industry.



Fugitive Emissions

Estimated loss of 131 Million Tons*
or
Estimated
\$2 Billion of Lost Revenue

* CO2 equivalent tons

Source: EPA - Inventory of U.S. GHG Emissions and Sinks 1990 -2004



What to do with
vent gas?

\$6.00/Mcf

Three Main Sources

Offshore Platforms

Tank Batteries

Gas Pneumatic Controls



How to Limit Emissions & Make Money at the Same Time

Vapor Recovery

Plunger Lifts

Compressed Air Controls

Why Vapor Recovery

Even water can have dissolved gas in solution. This is mostly true for deeper wells (>10,000 ft.).

Light volatiles from condensate can be captured (high Btu content).

Crude oil can yield as much as \$2 per bbl of vapor.

Vapor Recovery Costs

Vapor Recovery Unit Sizes and Costs

| Capacity (Mcf/d) | Compressor Horsepower | Capital Costs(\$) | Installation Costs(\$) | O&M Costs (\$/year) |
|-------------------------|------------------------------|--------------------------|-------------------------------|--------------------------------|
| 25 | 5 - 10 | 15,125 | 7,560 - 15,125 | 5,250 |
| 50 | 10 - 15 | 19,500 | 9,750 - 19,500 | 6,000 |
| 100 | 15 - 25 | 23,500 | 11,750 - 23,500 | 7,200 |
| 200 | 30 - 50 | 31,500 | 15,750 - 31,500 | 8,400 |
| 500 | 60 - 80 | 44,000 | 22,000 - 44,000 | 12,000 |

Note: Cost information provided by Natural Gas STAR partners and VRU manufacturers.

Four Steps

1. Identify Possible Locations for VRU.
2. Quantify the Volume of Emissions.
3. Measure the Site.
4. Evaluate Cost Benefits.

Example

With API Gravity of 38°

Separator Pressure = to 40 psi

Production of 1000 bbl/day

Vapor Emissions Rate = 43 Scf/bbl

Total Vapor Captured = 43 Mcf per day

Source: EPA

Why Plunger Lifts

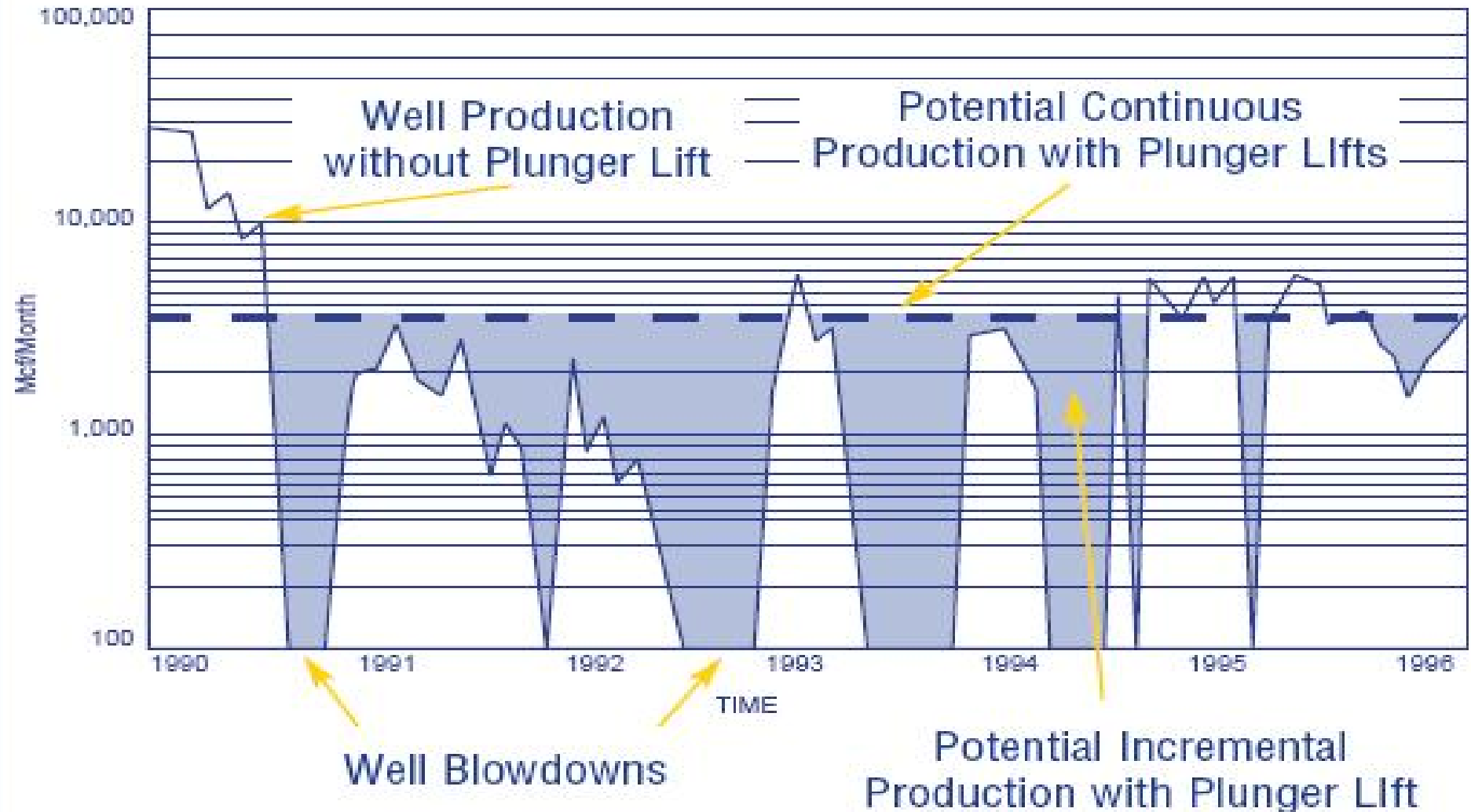
Plunger Lifts Limit

Blowdowns\$

Limited Venting or Flaring



Plunger Lifts



Plunger Lift Benefits

Revenue from Increased Production

Avoid Title V Issues

Fewer Workovers

Plunger Lift Evaluation

Common Requirements for Plunger Lift Applications

- ★ Well blowdowns and other fluid removal techniques are necessary to maintain production.
- ★ Wells must produce at least 400 scf of gas per barrel of fluid per 1,000 feet of depth.
- ★ Wells with shut-in wellhead pressure that is 1.5 times the sales line pressure.
- ★ Wells with scale or paraffin buildup.

Plunger Lift Pay Back

14 Wells at Midland Farm Field, Texas
Before Plunger Lift
Total Production 2510 Mcfd

30 Days After Plunger Lift Installation
Total Production 3869 Mcfd

Question

If a 10,000' well with a 8" casing
and 214.7 psig shut-in pressure
is vented weekly how much money
is lost annually?

Answer

\$15,864

Annually

Cost of a plunger lift \approx \$8000

Gas Pneumatic Case Studies

How much are you losing?

- Unocal Fresh Water Bayou Facility -
After installing the compressed air controls
increased throughput by 69,350 Mcf
annually.

\$416,100

Source: EPA

Gas Pneumatic Case Studies

Conversion Project Cost

\$60,000

Gas Pneumatic Case Studies

In South Louisiana Chevron – Texaco converted 10 facilities to compressed air at a cost of \$40,000.

Annual payback at today's prices
\$138,000

For More Information

Useful Web Sites

<http://www.epa.gov/gasstar/>

<http://www.fe.doe.gov/index.html>

<http://www.pttc.org/>

<http://www.icfi.com/Markets/Environment/>