

# Directed Inspection & Maintenance At Compressor and Gate Stations

Lessons Learned  
from Natural Gas STAR



NiSource and  
EPA's Natural Gas STAR Program  
June 3, 2003

# What is the Problem?

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- Gas leaks are invisible, unregulated and go unnoticed
- STAR partners find that valves, connectors, compressors and open-ended lines (OEL) are major sources
  - ◆ 50.7 Bcf/yr of methane are emitted by compressors and facility components
  - ◆ 1% of the leakers contribute 90% of the emissions
- Fugitive emissions depend on operating practices, equipment age and maintenance

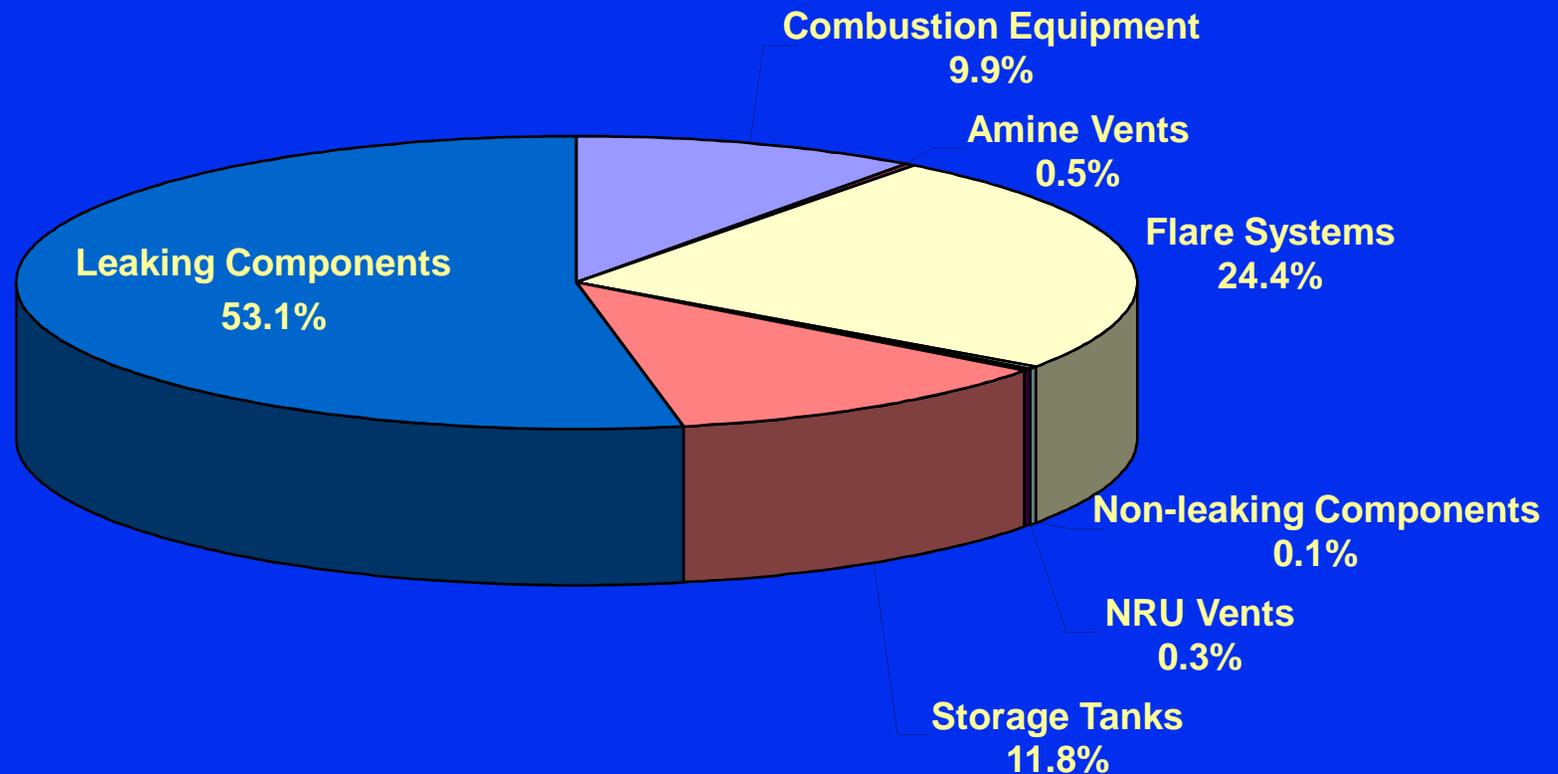


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# Distribution of Natural Gas Losses by Source Category

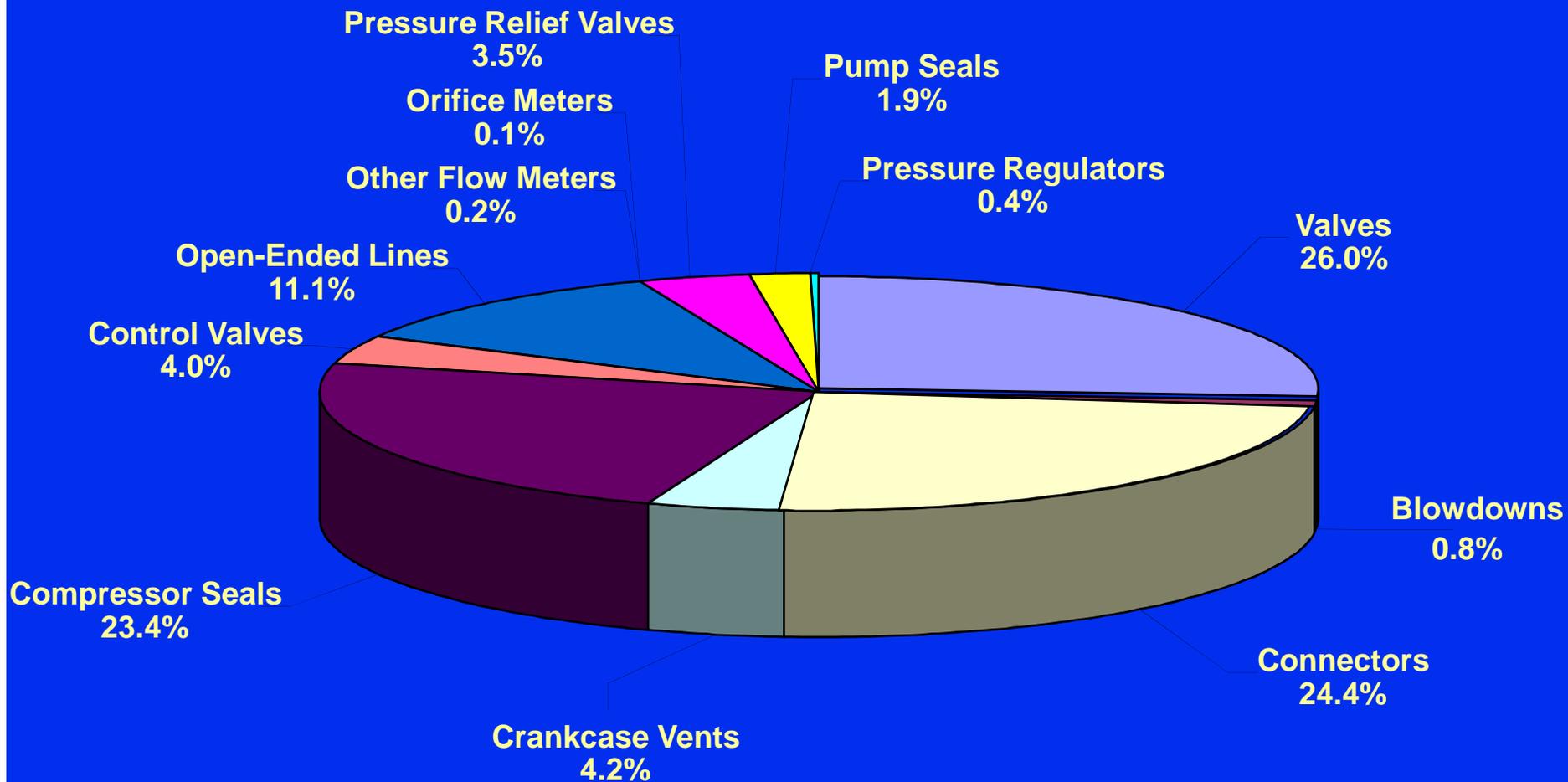


Source: Clearstone Engineering, 2002



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# Natural Gas Losses from Equipment Leaks by Type of Component



Source: Clearstone Engineering, 2002



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# How Much Methane is Emitted?

## □ Study covered 13 Stations

- ◆ Average: 7 recipis
- ◆ Average: 2 turbines
- ◆ Inlet: 500-700 psi
- ◆ Outlet: 700-1,000 psi
- ◆ 34,400 components tested
- ◆ Average: 2,707 components per station

## □ Findings

- ◆ 5% leakers or 135 components
- ◆ 385-200,000 Mcf/yr total leakage rates
- ◆ Average: 41,000 Mcf/yr



Source: 1999 EPA/GRI/PRCI Study

# How Can These Losses Be Reduced?

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## □ Implementing a Directed Inspection and Maintenance Program

- ◆ Voluntary program to identify and fix leaks that are cost effective to repair
- ◆ Outside of mandatory LDAR program
- ◆ Survey cost will pay out in the first year
- ◆ Provides valuable data on leakers

AND of course, implementing other *BMP's* and *PRO's*!

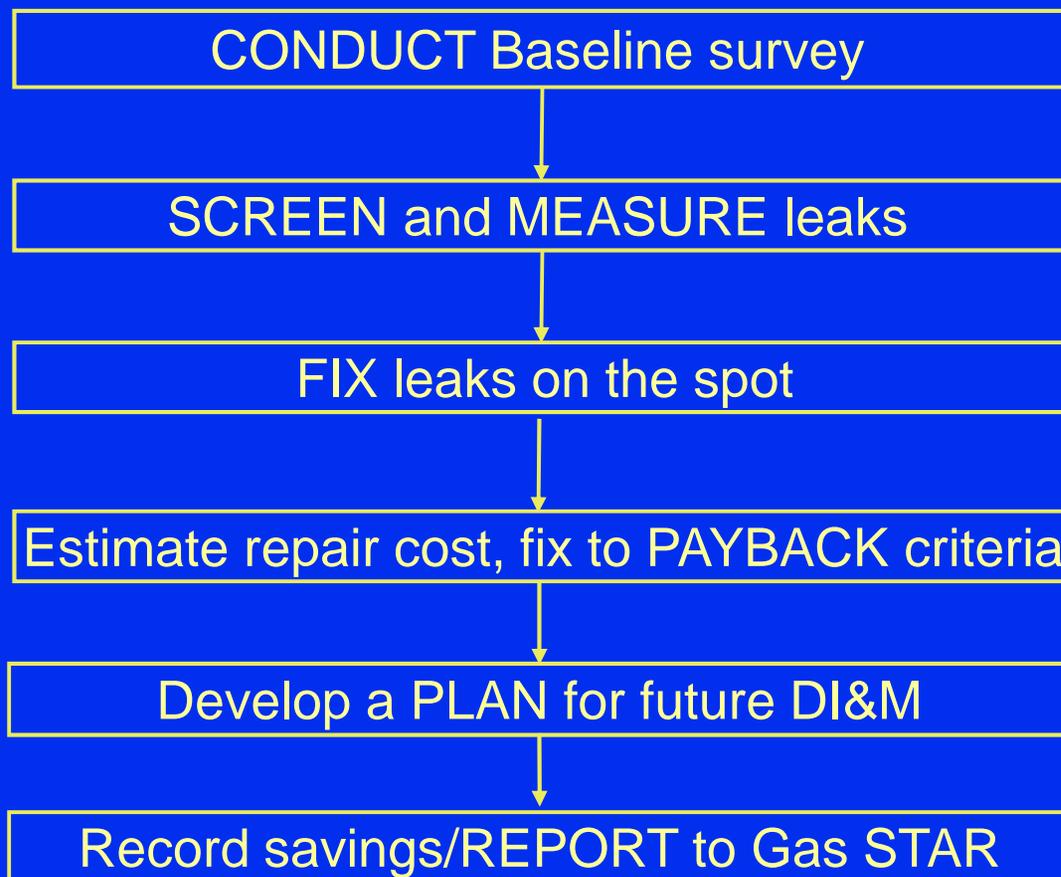


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# How Do You Implement a DI&M Program?

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# How Do You Implement a DI&M Program?

| Summary of Screening and Measurement Techniques |               |                             |
|---|---------------|-----------------------------|
| Instrument/<br>Technique                        | Effectiveness | Approximate<br>Capital Cost |
| Soap Solution                                   | ★ ★           | \$                          |
| Electronic Gas Detectors                        | ★             | \$\$                        |
| Acoustic Detection/ Ultrasound Detection        | ★ ★           | \$\$\$                      |
| TVA (FID)                                       | ★             | \$\$\$                      |
| Bagging   | ★             | \$\$\$                      |
| High Volume Sampler                             | ★ ★ ★         | \$\$\$                      |
| Rotameter                                       | ★ ★           | \$\$                        |

Source: EPA's Lessons Learned Study



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# Cost-Effective Repair Examples

| Repair the Cost Effective Components |                                     |                            |                  |
|--------------------------------------|-------------------------------------|----------------------------|------------------|
| Component                            | Value of Lost gas <sup>1</sup> (\$) | Estimated Repair cost (\$) | Payback (Months) |
| Plug Valve: Valve Body               | 12,641                              | 200                        | 0.2              |
| Union: Fuel Gas Line                 | 12,155                              | 100                        | 0.1              |
| Threaded Connection                  | 10,446                              | 10                         | 0.0              |
| Distance Piece: Rod Packing          | 7,649                               | 2,000                      | 3.1              |
| Open-Ended Line                      | 6,959                               | 60                         | 0.1              |
| Compressor Seals                     | 5,783                               | 2,000                      | 4.2              |
| Gate Valve                           | 4,729                               | 60                         | 0.2              |

Source: Hydrocarbon Processing, May 2002  
<sup>1</sup>Based on \$3/Mcf gas price



## **DI&M – Transmission Partner Experience**

- Partner A: 15 Stations surveyed annually
  - ◆ Survey and repairs averaged \$350/station
  - ◆ Methane savings averaged 11,067 Mcf/station

Total Gas Savings \$ 498,030

Total DI&M Cost \$ (5,250)

SAVINGS \$ 492,780

- Partner B: 2 Stations surveyed quarterly
  - ◆ Survey costs \$200/station
  - ◆ 24 leaks detected & repaired; 23 repaired at average \$50 each

Total Gas Savings \$ 51,240

Total DI&M Cost \$ (2,750)

SAVINGS \$ 48,490



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# DI&M – Distribution Partner Experience

## □ Partner C: 86 Stations surveyed

- ◆ Repairs made to 66 of 105 leaks found
- ◆ Gas savings totaled 1,519 Mcf, with net savings averaging \$50 per facility surveyed

Total Gas Savings \$ 6,557

Survey Costs \$ (1,700)

Repair Costs \$ ( 753)

Savings \$ 4,104

## □ Partner D: surveyed 306 facilities

- ◆ Repaired 824 leaks, four described as “large”
- ◆ Gas savings totaled 117,800 Mcf, 143 Mcf per leak

Total Gas Savings \$ 353,430

Total DI&M Costs \$ ( 16,500)

Net Savings \$ 336,930



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# Related Studies and PRO Fact Sheets

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## □ Lessons Learned Studies

- ◆ DI&M at Compressor Stations
- ◆ DI&M at Gate Stations and Surface Facilities
- ◆ DI&M at Gas Processing Plants and Booster Stations

## □ PRO Fact Sheets

- ◆ DI&M at Remote Facilities



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## Discussion Questions

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- ❑ To what extent are you implementing this practice?
- ❑ Do you have other best practice opportunities to improve on this practice?
- ❑ How could these Lessons Learned studies be improved upon or altered for use in your operation(s)?
- ❑ What are the barriers (technological, economic, lack of information, regulatory, etc.) that are preventing you from implementing this practice?

