Processor Best Management Practices and Opportunities

Lessons Learned from Natural Gas STAR

Processors Technology Transfer Workshop

Pioneer Natural Resources, Inc.,
Gas Processors Association and
EPA's Natural Gas STAR Program

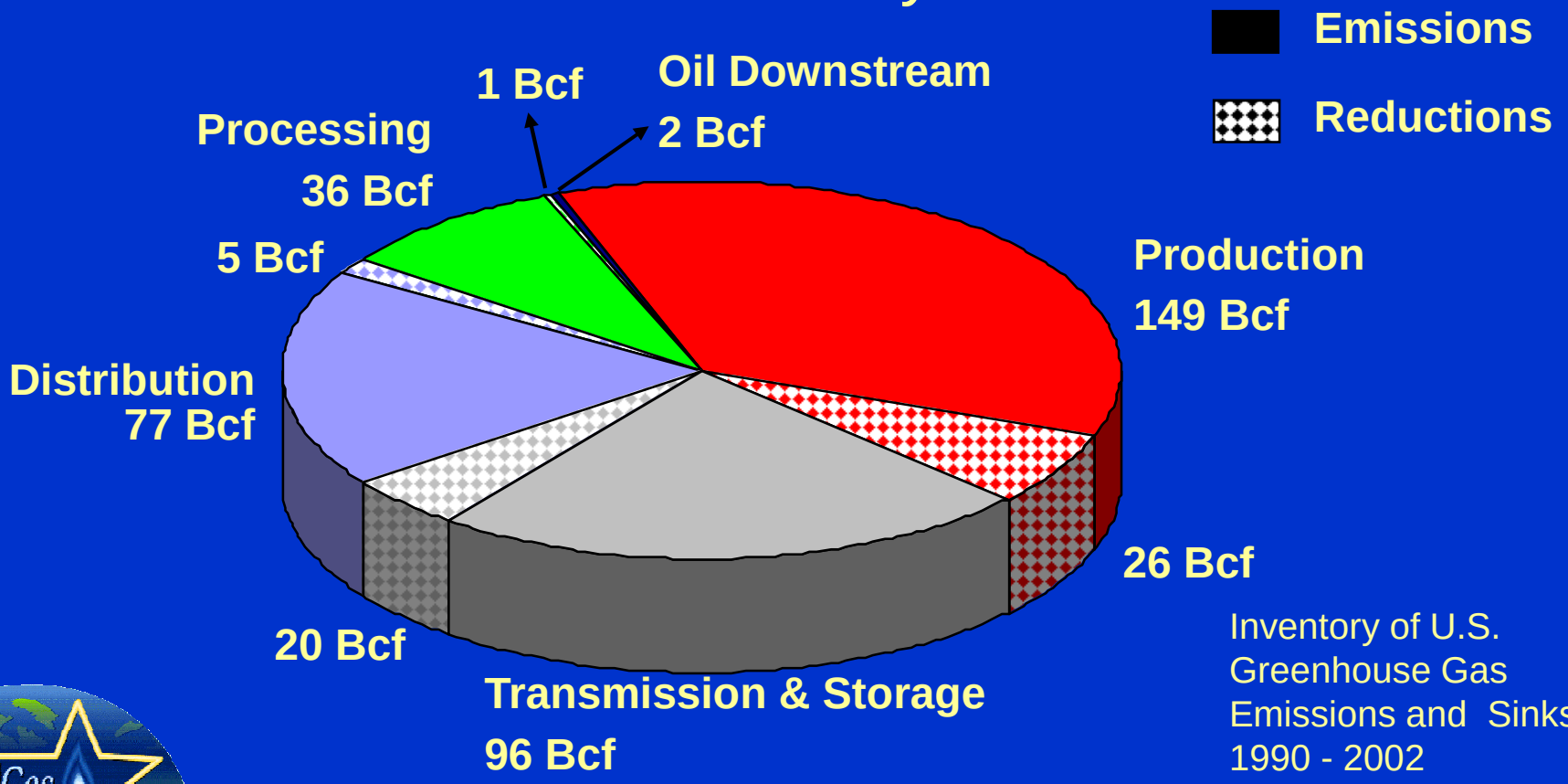
September 23, 2004

Processor Applicable PRO: Agenda

- Processor Sector Emissions
- Processor Sector Best Management Practices (BMPs)
- Top Partner Reported Opportunities (PROs)
- Selected PRO Overviews
- Discussion Questions

Natural Gas and Petroleum Industry Emissions

- Processing sector responsible for 36 Bcf of methane emissions annually



Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 - 2002

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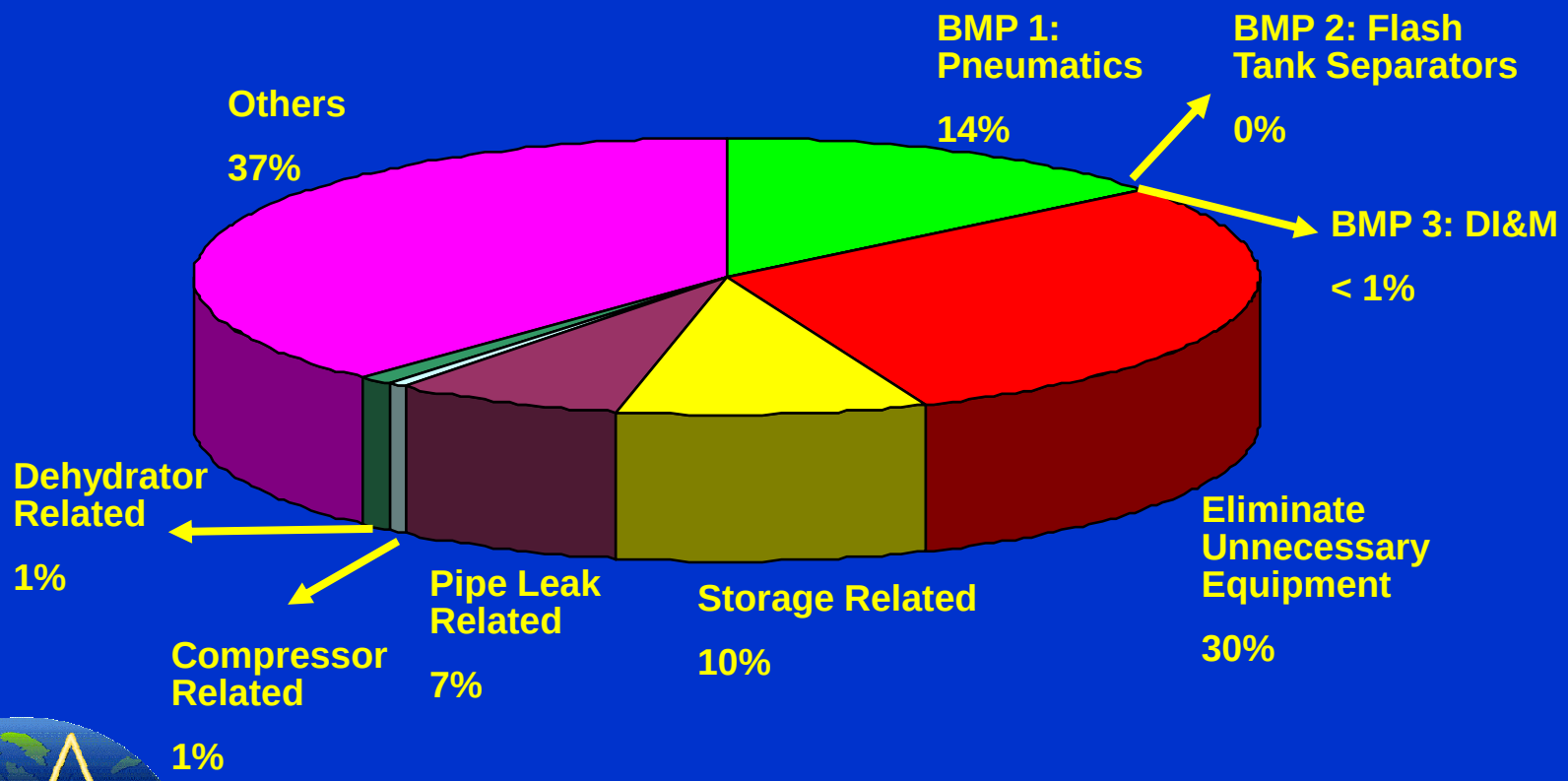
Processor Best Management Practices

- BMPs: The consensus best practices
  - **BMP 1: Convert Gas Pneumatics to Instrument Air Systems**
  - **BMP 2: Install Flash Tank Separators on Glycol Dehydrators**
  - **BMP 3: Directed Inspection and Maintenance at Gas Processing Plants and Booster Stations**
  - **BMP 4: Partner Reported Opportunities**

Processor BMP

- 86% of the processing sector reductions came from PROs



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BMP 1: Convert Gas Pneumatic Controls to Instrument Air

- What is the problem?
  - **Gas pneumatic control bleeds at gathering boosting stations**
- BMP
  - **Convert natural gas powered pneumatic control systems to instrument air systems**
- Methane savings
  - **At a gas price of $3/Mcf and savings from reduced emissions at $360 per year per device**

Methane Savings

20,000 Mcf/yr

Project Economics

Project Cost	**$50,000**
Payback	**< 1 yr**

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BMP 2: Install Flash Tank Separators in Glycol Dehydrators

- What is the problem?
  - **Methane absorbed by glycol in the dehydration system is vented during regeneration**
- BMP
  - **Install flash tank Separator to capture approx. 90% of the methane from the glycol before regeneration**
- Methane savings
  - **Based on energy exchange pump circulating 150-450 gallons/hr**

Methane Savings

250 - 7,500 Mcf/yr

Project Economics

Project Cost	**$5,000 - $14,000**
Payback	**< 1.5 yr**

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BMP 3: DI&M at Gas Processing Plants and Booster Stations

- What is the problem?
  - **Methane emissions from leaking compressors and other equipment components like valves, connectors, seals and OELs**
- Partner solution
  - **Baseline survey to identify and quantify leaks; subsequent surveys based on previous surveys**
- Methane savings
  - **Depends on facility size and types of repairs made**

Methane Savings

45 - 128 MMcf/plant-yr

Project Economics

Project Cost	**> $10,000**
Payback	**< 1.5 year**

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BMP4: Partner Reported Opportunities (PROs)

- *Partner*
  - **Generated by Gas STAR Partners - your peers**
- *Reported*
  - **Submitted to EPA in Partners' Annual Reports**
- *Opportunities*
  - **Peer-identified, cost-effective practices and technologies to reduce methane emissions**

PRO Fact Sheets

- Additional valuable information
  - **Facilitate technology transfer**
  - **One page**
  - **Easy to review**
- 27 PROs apply to Processing sector
  - **11 focused on operating practices**
  - **16 focused on technologies**
- PRO Fact Sheets are derived from Annual Reports 1994-2002
  - **Total 57 posted PROs at epa.gov/gasstar/pro/index.htm**

Overview of PROs

- Sample of Processing PROs
  - **Begin DI&M at Remote Facilities**
  - **Convert Engine Starting to Nitrogen**
  - **Convert Pneumatics To Mechanical Controls**
  - **Eliminate Unnecessary Equipment and/or Systems**
  - **Install Electric Starters**
  - **Pipe Glycol Dehydrator to VRU**
  - **Recycle Line Recovers Gas During Condensate Loading**
  - **Replace Ignition –Reduce False Starts**
  - **Use Inert Gases & Pigs to Perform Pipeline Purges**
  - **Use of Composite Wrap Repair**

Operating Practice PROs

- Rerouting of glycol skimmer gas
- Pipe glycol dehydrator to vapor recovery unit
- Inspect and repair compressor station blowdown valves
- Begin DI&M at remote facilities

Rerouting of Glycol Skimmer Gas

- What is the problem?
  - **Non-condensable gas from the condensate separator is vented**
- Partner solution
  - **Reroute the condensate separator gas to reboiler firebox for fuel use**
- Methane savings
  - **Based on a dehydrator having a gas entrainment rate of 3 cf/ gallon of glycol and gas containing 95% methane**
- Applicability
  - **All dehydrators with vent condensers**

Methane Savings

7,600 Mcf/yr

Project Economics

Project Cost	**< $1,000**
Annual O&M Costs	**$100 - $1,000**
Payback	**< 1 yr**

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Pipe Glycol Dehydrator to Vapor Recovery Unit

- What is the problem?
  - **Methane gas from wet glycol used to run gas assist pumps is vented to the atmosphere**
- Partner solution
  - **Reroute vented gas to Vapor Recovery Unit (VRU)**
- Methane savings
  - **Based on an electric or energy exchange circulation pump can recover 0.3 to 0.9 Mcf of methane per MMcf of gas processed**
- Applicability
  - **No limitations when the VRU discharges to a compressor suction**

Methane Savings

3,300 Mcf/yr

Project Economics

Project Cost	**$1,000 - $10,000**
Annual O&M Costs	**> $1,000**
Payback	**< 1 yr**

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Inspect & Repair Compressor Station Blowdown Valves

- What is the problem?
  - **Pressure, thermal and mechanical stresses wear blowdown valves making them significant emission sources through inaccessible vent stacks**
- Partner solution
  - **Annually inspect and repair leaking blowdown valves at compressor stations**
- Methane savings
  - **Based on EPA emission factor for transmission compressor station blowdown valves**
- Applicability
  - **Applicable to all sites**

Methane Savings

2,000 Mcf/yr

Project Economics

Project Cost	**None**
Annual O&M Costs	**$100 - $1,000**
Payback	**< 1 yr**

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Begin DI&M at Remote Facilities

- What is the problem?
  - **Fluctuations in pressure, temperature and mechanical stresses on pipeline components (such as valves and seals) cause methane leakage**
- Partner solution
  - **Extend DI&M program to remote facilities**
- Methane savings
  - **Based on valve stem leak range 1-24 Mcf/yr and open ended blowdown valve average leak of 350 Mcf/yr**
- Applicability
  - **All gathering/ boosting facilities**

Methane Savings

362 Mcf/yr

Project Economics

Project Cost	**None**
Annual O&M Costs	**$100 - $1,000**
Payback	**1-3 yr**

Eliminate Unnecessary Equipment and/or Systems

- ExxonMobil
  - Replaced a 930 horsepower (Hp) compressor with 465 Hp at its Fresh Water Bayou facility in southern Vermilion Parish, Louisiana
    - **Total project cost = $30,000**
    - **Emissions reductions = 1,556 Mcf/yr**
    - **Value Savings: $3/Mcf x 1556 Mcf = $4,668/yr**
  - Took two satellite tanks out of service and began pumping directly to the tank battery
    - **Total project cost = $120,000**
    - **Emissions reductions = 15,735 Mcf/yr**
    - **Value Savings: $3/Mcf x 15,735 Mcf = $47,205/yr**

Technology PROs

- Install pressurized storage of condensate
- Use of composite wrap repair
- Use ultrasound to identify leaks
- Recycle line recovers gas during condensate loading
- Convert gas-driven chemical pumps to instrument air

Install Pressurized Storage of Condensate

- What is the problem?
  - **Condensate from pigging gathering lines flashes methane to atmosphere when transferred to atmospheric tanks**
- Partner solution
  - **Pressurized storage and transport of condensate for economic methane recovery**
- Methane savings
  - **Based on estimate of condensate production of 0.01 barrel per Mscf of gas production and methane emissions of 0.25 Mcf/ barrel**
- Applicability
  - **All gathering/boosting stations and processing plants**

Methane Savings

7,000 Mcf/yr

Project Economics

Project Cost	**> $10,000**
Annual O&M Costs	**> $1,000**
Payback	**1- 3 yrs**

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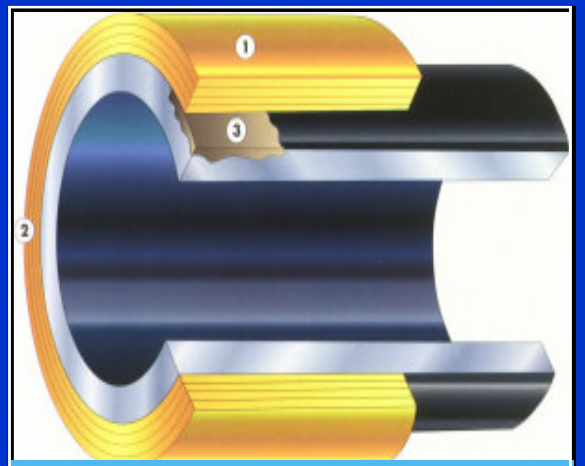
Use of Composite Wrap Repair

- Repairing non-leaking pipeline damage with composite wrap sleeves, such as Clock Spring®
  - **Eliminates venting emissions**
  - **Inexpensive**
  - **Can repair while operating**



Source: Clock Spring® Company L. P.

- Non-leaking pipeline defects
  - **Corrosion**
  - **Dents**
  - **Gouges**

Use of Composite Wrap Repair

- What is the problem?
  - **Pipeline is shutdown and vented to cut and weld pipe segment in damaged areas**
- Partner solution
  - **Use composite wrap, which consists of a filler material, a thin composite wrap and a special adhesive**
- Methane savings
  - **Based on repair frequencies between 2 - 65 times per year**
- Applicability
  - **Suitable for non-leaking defects on straight sections with up to 80% wall loss and no internal corrosion**

Methane Savings

5,400 Mcf/yr

Project Economics

Project Cost	**> $10,000**
Annual O&M Costs	**< $100**
Payback	**< 1 yr**

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Use Ultrasound to Identify Leaks

- What is the problem?
  - **Leakage through shut-off valves in open-ended lines cannot be easily detected due to inaccessible vents**
- Partner solution
  - **Use ultrasonic leak detectors which can detect internal leaks**
- Methane savings
  - **Assumption that 100 leaks can be found with an emission rate averaging 20 Mcf/yr/valve**
- Applicability
  - **All in-service valves that shut-off gas vent to the atmosphere**

Methane Savings

2,000 Mcf/yr

Project Economics

Project Cost	**< $1,000**
Annual O&M Costs	**> $1,000**
Payback	**1 - 3 yrs**

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Recycle Line Recovers Gas During Condensate Loading

- What is the problem?
  - **Pigged condensate when transferred from storage into tank trucks generates methane vapor that is vented**
- Partner solution
  - **Connect tank truck vent to condensate storage tank**
- Methane savings
  - **Based on assumption of 100 loading transfers per year and methane emission from evaporation of 50% of total volume of tank filled**
- Applicability
  - **All processing facilities that use tank trucks for transportation of pigged condensate**

Methane Savings

100 Mcf/yr

Project Economics

Project Cost	**$1,000-$10,000**
Annual O&M Costs	**$100 - $1,000**
Payback	**3 – 10 yrs**

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Convert Gas-Driven Chemical Pumps to Instrument Air

- What is the problem?
  - **Pressurized gas used to drive chemical transfer/ glycol dehydration unit pumps is vented to the atmosphere**
- Partner solution
  - **Use instrument air to drive the pumps**
- Methane savings
  - **Based on methane emissions reduction rate of 2 cf per gallon of glycol circulated**
- Applicability
  - **All sites with available electric power**

Methane Savings

2,500 Mcf/yr

Project Economics

Project Cost	**$1,000-$10,000**
Annual O&M Costs	**$100 - $1,000**
Payback	**< 1 yr**

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The Future: PROs

- Broad dissemination of PROs is key to program success and effective peer-based technology transfer
  - **Promising PRO Fact Sheets**
    - **Recover gas produced during rich gas field pigging operations**
    - **Zero emission dehydrators**

Discussion Questions

- To what extent are you implementing any of these PROs?
- What are the barriers (technological, economic, lack of information, regulatory, etc.) that are preventing you from implementing any of these technologies?