Anadarko Vernal, UT Operations

- APC Operates 1600 Wells in the Uinta Basin and Produces 380 MMCFD of Clean Burning Natural Gas that can Heat over 2.8 Million Homes
- APC Currently has over 190 Employees and 600 Plus Contractors in the Uinta Basin
- APC Provided over 130 Million Dollars in Revenue to the Federal, State, and Local Governments in 2009
Anadarko Vernal, UT Operations

- Anadarko is Actively Executing Methane Emission Elimination and Reduction Strategies in the Greater Natural Buttes
- Current Emission Reduction Initiatives
  - Reduced Emission Completions
  - Sandpiper Pump Modification
  - Solar Circulation Pumps

Reduced Emission Completions

- APC field personnel designed to fit characteristics of Uinta Basin flowbacks
- All Flowback Material is Flowed Through the HAL9000 Unit Following the Well Stimulation Treatment
- The 2-Stage Unit Separates Solids and Fluids
- 1st Stage Captures Residual Sand Volumes from Flow Stream
- 2nd Stage Separates Liquid and Gas
- Gas Volumes are then Metered and Flowed to Sales
Reduced Emission Completions

TYPICAL FLOWBACK SEPARATOR SCHEMATIC - NATURAL BUTTES AREA

CONDENSATE TANK 300 BBL
WATER TANK 300 BBL
GAS SALE LINE
GAS METER INSIDE SEPARATOR
PROD SEPARATOR
PERMANENT FLOWLINE
FLOW BACK SEPARATOR
FLOWBACK INLET
WELL HEAD
FLOWBACK OUTLET
WATER DUMP LINE
SAND DUMP LINE
RESERVE PIT

Reduced Emission Completions

HAL9000 Gas Separator Unit

2-Phase Separation Bottle
Sand Separation Bottle
Inspection Port
Dump to Pit
# GNB Completion CH₄ Emission Savings

<table>
<thead>
<tr>
<th>Year</th>
<th>Wells Completed HAL9000</th>
<th>Historical Flowback Time</th>
<th><strong>Estimated Gas Captured</strong></th>
<th>Estimated Methane Captured</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Days</td>
<td>MMSCF</td>
<td>X10³ TONS</td>
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<tr>
<td>2005</td>
<td>8</td>
<td>5</td>
<td>65</td>
<td>1.4</td>
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<tr>
<td>2006</td>
<td>179</td>
<td>5</td>
<td>1454</td>
<td>31.4</td>
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<tr>
<td>2007</td>
<td>168</td>
<td>5</td>
<td>1365</td>
<td>29.5</td>
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<tr>
<td>2008</td>
<td>288</td>
<td>5</td>
<td>2340</td>
<td>50.6</td>
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<tr>
<td>2009</td>
<td>191</td>
<td>5</td>
<td>1552</td>
<td>33.5</td>
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<tr>
<td>2010</td>
<td><em>250</em></td>
<td>5</td>
<td>2031</td>
<td><em>43.9</em></td>
</tr>
<tr>
<td>Total</td>
<td>847</td>
<td>5</td>
<td>8807</td>
<td>146.4</td>
</tr>
</tbody>
</table>

* 2010 Estimated Completions
** Based on Average Daily Gas Flowrate of 1625 Mcfd

# Sandpiper Pump Modification

- **Sandpiper Pump used to Circulate Glycol to Prevent Freezing**
  - Routes Sandpiper Pumps exhaust gas (CH₄) to Separator as Fuel
  - Sandpiper Exhaust Approximately 20 to 25 Mcfd
  - Exhaust can Operate Methanol Injection Pump if Burner is off

- **Scrubber System used to Prevent Backflow from Existing Fuel System**

- **Installed on 30 Pumps in Basin**
  - Recovered an Average of 15 Mcfd Per Pump
  - Over 120-Day Season, Device will Reduce Methane Emissions by 2.2 Tons Per Year
Process Flow Overview

**Before**
- Sandpiper Pneumatic Pump – operating heat trace
- Discharge Gas Vented to Atmosphere (20-25 Mccld)
- Positive Displacement Pump
- High Pressure Field Gas (20-30 psi)

**After**
- Pressure Regulator (15 psi)
- Gas to Fuel System (<15 psi)
- Sandpiper Pneumatic Pump – operating heat trace
- High Pressure Field Gas (20-30 psi)

Installed System

- Fuel gas line to separator
- Exhaust gas scrubber
- Pump exhaust
Solar Powered Methanol Circulation Pumps

- Pumps Run on Electricity and Battery Operated
- Battery is Charged by Solar Panel
- Gas Driven Pumps are Used as Backup During Times of Limited Sunlight
- Currently there are 12 Pumps in Operation as Pilot Test
- Project May be Expanded if Pilot Test Successful

Installed Solar Circulation Pumps