Reducing Methane Emissions During Completion Operations

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EPA

Reducing Methane Emissions during Completion Operations

Williams Production RMT – Piceance Basin Operations

Agenda

- Objectives
- Piceance Basin Well Completion Process Description
- Equipment Needed
- Economics
- Conclusion

Objectives:

- Virtually eliminate venting of natural gas produced during new well completions.
- Capture produced gas and deliver to sales.
- Meter produced gas for revenue distributions.
- Ensure safety of personnel during entire process.

Piceance Basin Well Completions

- Williams Fork Formation – low permeability, tight, lenticular sandstone
- 10-acre Spacing
- Wells drilled to depths of 6,500 ft to 9,000 ft.
- Reservoir pressures as high as 4000 psi.
- Fracture stimulation required to make wells economical.
- Typically fracture stimulate 5 to 6 separate stages per well.

Piceance Basin Well Completions

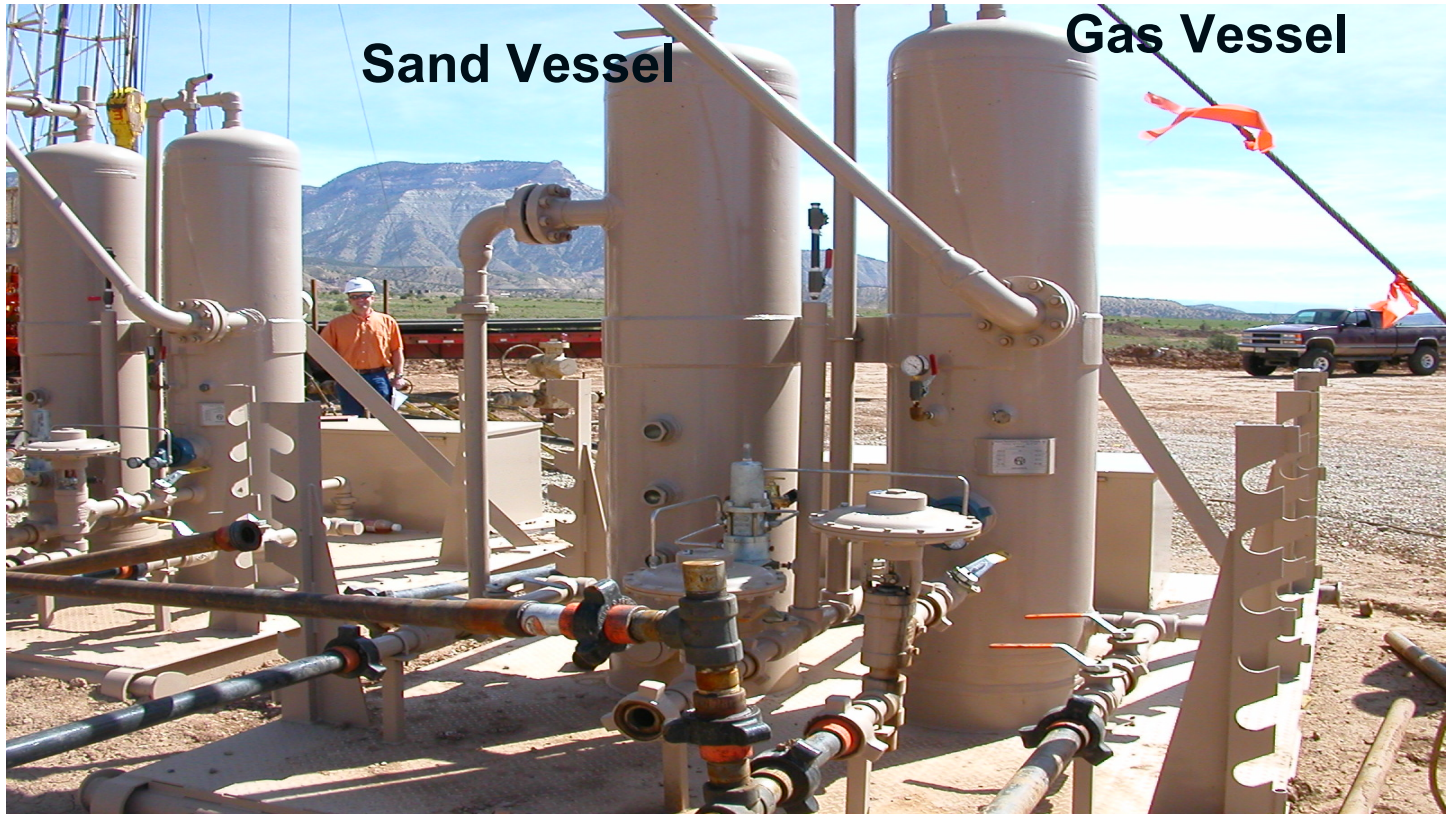
- Perforate casing prior to Stage 1 – makes fracture stimulation possible
- Fracture Stimulate Stage 1. Flowback until next step.
- Shut in well. Set casing plug to isolate next stage to be fracture stimulated.
- REPEAT for each stage (avg. 5 to 6 stages/well)
- Once fracture stimulations are done, all of the plugs are drilled out using a Workover Rig.
- Stimulation fluids and gas are produced while plugs are drilled out.
- Drillout phase is when most of the gas is vented.

Sand Flowback Problems

Green Completions

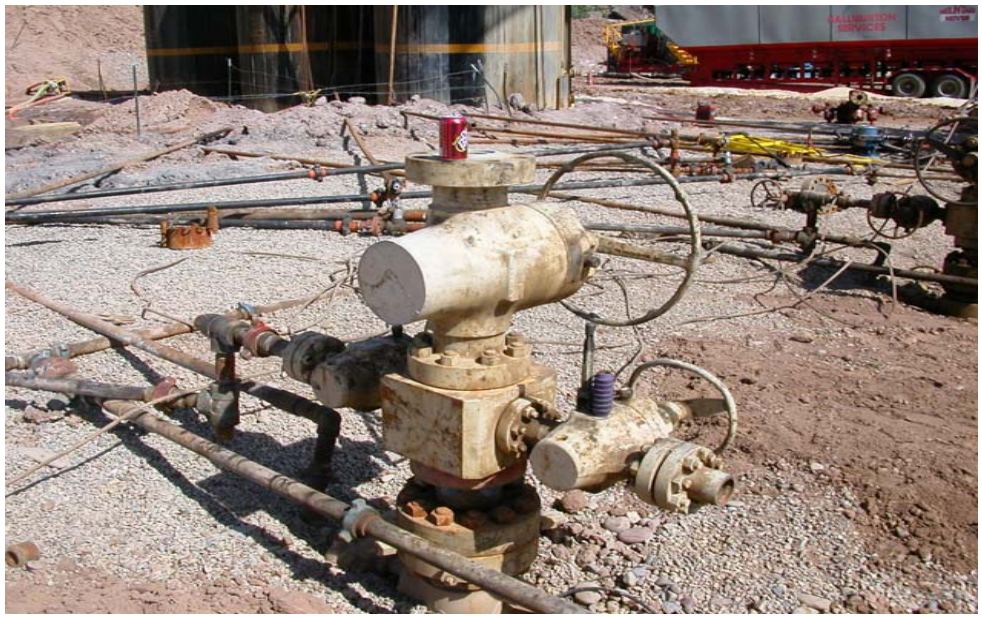
- Technology used to recover gas that is otherwise vented or flared during the completion phase of natural gas well.
- Williams designed equipment to handle high pressure, high rate flowback fluids so as to safely handle and to sell the natural gas produced during flowback period.
- Flowback equipment is used to separate sand, water and gas during initial flowback.

Flowback Unit



Flowback Unit - Operation

- Sand Vessel separates sand from flowback liquids.
- Sand is dumped to reserve pit. Gas and Liquids dump to the Gas Vessel.



Flowback Unit - Operation

- Gas Vessel separates gas from water used for fracture stimulation.
  - Gas routed to sales line.
- Water dumps to holding tanks automatically
  - Water is filtered and reused for future fracture stimulation jobs.
- Vessels operate at 275 to 300 psi.

Risks

Safety – Primary Concern

- High pressure gas, liquids and sand can erode steel pipe.
- To mitigate safety concerns:
  - Pipe, Fittings and Vessels use high strength metal
  - Flowback Units are monitored 24/7.

Simultaneous Operations

Drilling

Completion

Drillout

Production

Risks

Operations & Reservoir Risks

- Fluids pumped downhole must be recovered as quickly as possible
- Wellbore damage by fluids can diminish production
- Flowing fluids to flowback skid results in decreased flowback rates because of high backpressure (versus no backpressure when venting)

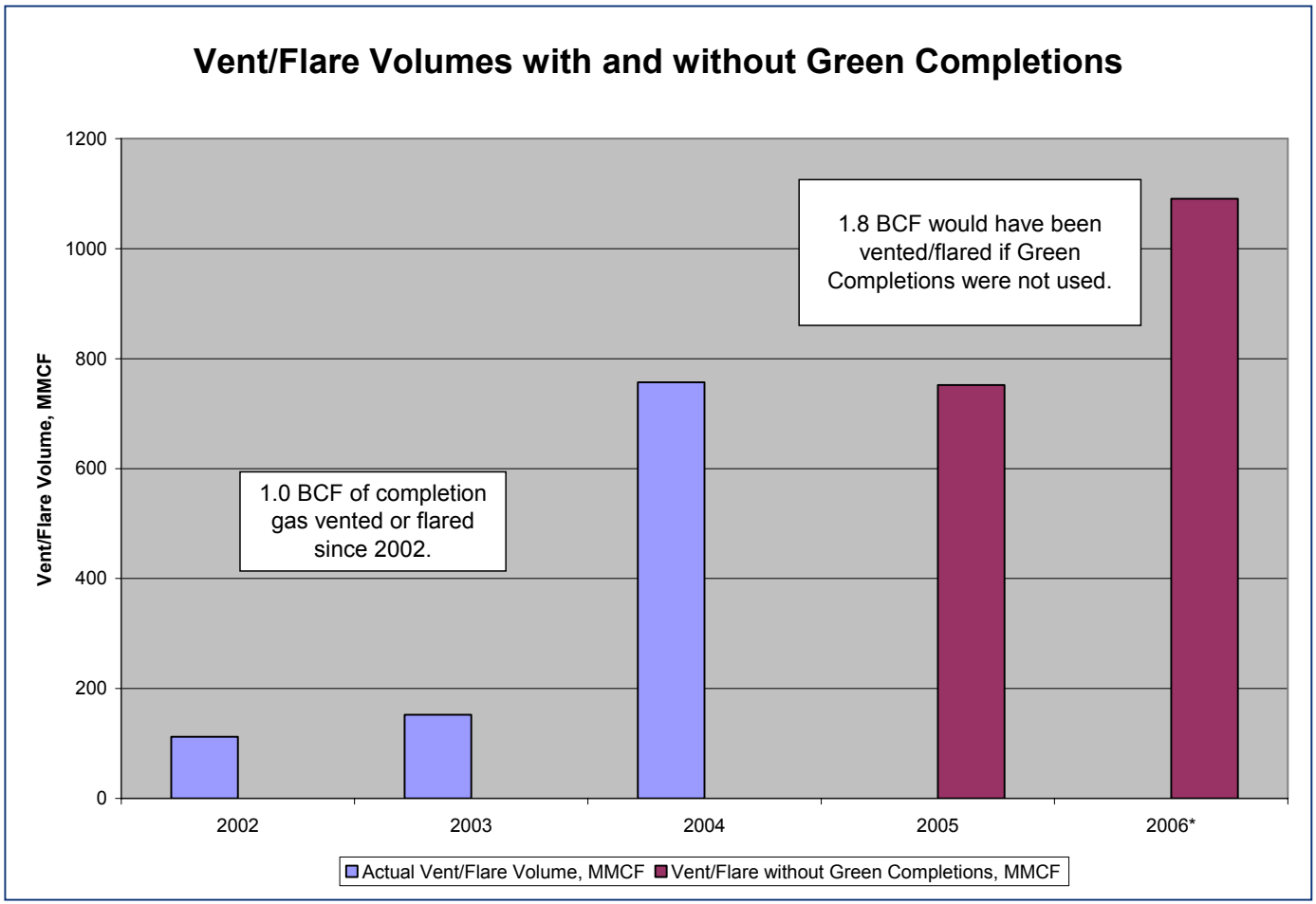
Economics – Volume Recovered

Year	Total Number of Well Spuds	No. of Spuds Not Completed or Completed Without Flowback	Actual Number of Flowback Completions	Actual Completion Gas Generated (MMCF)	Actual Completion Gas Vented/Flared (MMCF)	Flowback Gas Recovered (MMCF)	Flowback Gas Recovered (%)
2002	75	14	61	599	112	487	81.3%
2003	80	9	71	1348	152	1196	88.8%
2004	253	34	219	5635	757	4878	86.6%
2005	302	0	302	6718	0	6718	100.0%
2006*	445	0	445	9740	0	9740	100.0%

* - Forecasted

Prior to “Green Completions” only 88% of the Completion gas was recovered.

Economics – Savings Realized



Economics – Savings Realized

Flowback Revenue/Cost Analysis			
Year	Total Revenue (MM$)	Recovery Cost (MM$)	Net Savings (MM$)
2002	1.28	0.22	1.06
2003	6.32	0.89	5.43
2004	27.87	2.85	25.02
2005	42.68	6.72	35.96
2006*	50.06	11.38	38.68

* - Forecasted

Conclusion

- Reduces methane emissions, a potent Green House Gas (GHG)
- Well completion type determines viability of Green Completion Technologies
- Produced water and stimulation fluids from green completions are recycled
- Eliminates emissions, noise and citizen complaints associated with flaring
- Increases Economic Value Added

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