Regulators' Workshop on Flaring Reduction

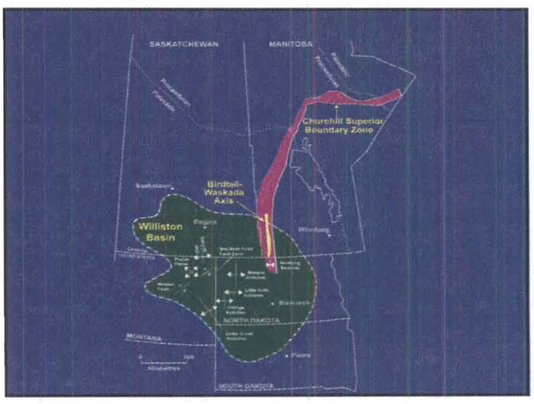
Manitoba Report on Flaring and Venting

Calgary, Alberta
September 15, 2006

Manitoba

Manitoba Report on Flaring and Venting

- Provincial oil & gas overview
- Recent oil & gas activity
- Oil & gas legislation
- Flaring & venting reduction initiatives
- Flaring & venting reduction barriers
- Planned activities

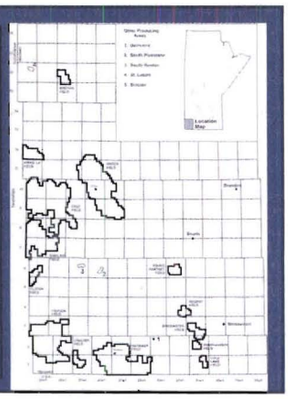


Manitoba Oil Pools

- Depth 430 – 1050 m
- Porosity 9 – 14% carbonates
  13 – 17% sandstones
- Permeability < 10 md
- Pressure < 10 000 kPa
- Density 25 – 40° API
- GOR < 5 – 100 m^3/m^3
- IP 3 – 8 m^3/d vertical
  < 50 m^3/d horizontal
- Recovery 5 - 15% primary
  20 – 35% secondary

2005 Oil Activity

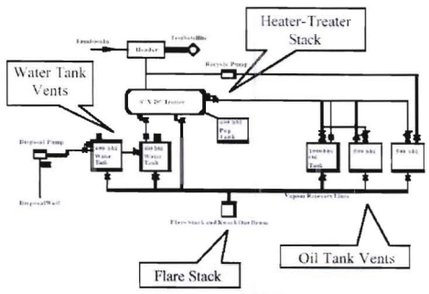
- Wells drilled – 285
- Producing wells – 1863
- No. of batteries - 91
- Oil production – 2 225 m3/d
- Solution gas production
  17.5 $10^6 m^3$
- Industry expenditures
  $ 243 million

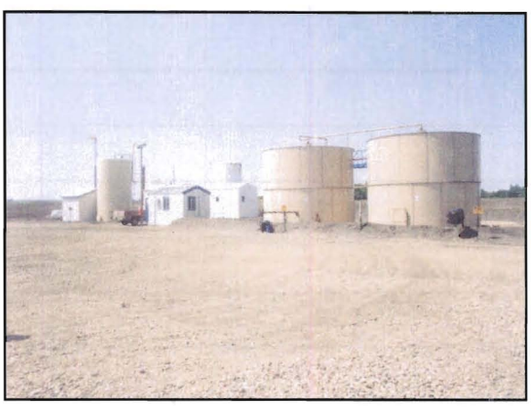


Manitoba Oil & Gas Legislation

- Oil & Gas Act
  - Drilling & Production Regulation
    - guidelines for permitting and operation of batteries
    - interdepartmental battery application review committee (IBARC)
- Manitoba Petroleum Branch
  - website www.gov.mb.ca/iedm/petroleum

Typical Emission Sources





Flaring & Venting Reduction Initiatives

- New regulations for permitting and operation of batteries
- Joined GGFR initiative
- Amendments to Oil & Gas Act to strengthen environmental protection and enforcement
- Established IBARC
- Facilitated discussions between producers & utilities – gas conservation & alternate uses

Permitting & Operation of Batteries

Key Changes

- Adopted Manitoba air quality guidelines
- New battery application requirements
- New flare design and operation standards
- Existing battery re-permitting program
- H_2S safety requirements for batteries

Application Requirements for New Batteries

- Expanded public consultation & notification
- Solution gas management plans
- Flare system design & operation
- Air dispersion modelling results

Battery Re-Permitting

- Introduced program to evaluate flaring and venting at existing batteries
- Emissions to meet Manitoba Ambient Air Quality Guidelines for H_2S & SO_2
- Application deadlines
  - application due April 30, 2002
  - any battery modifications completed by October 31, 2002
- Failure to meet deadlines Battery Operating Permit cancelled

Battery Re-Permitting

- Application Requirements
  - consultation with landowners/occupants within 0.5 km and previous complainants
  - accurate estimates of gas production & disposition - fuel, flared & vented
  - details of flare & venting systems
  - air dispersion modelling results
  - battery modifications proposed to bring H_2S & SO_2 emissions into compliance with air quality guidelines

Battery Re-Permitting

- Battery Modifications
  - Modifications made at 45 of 79 batteries
  - Estimated cost - $2.7 million
- Type of modifications
  - Modifications designed to enhance dispersion of vented gas
  - Modifications designed to improve flare system efficiency
  - Modifications designed to remove H_2S from vented gas streams
  - Modifications designed to reduce vented gas volumes or completely eliminate venting

Battery Re-Permitting

- Benefits
  - battery H_2S & SO_2 emissions comply with air quality guidelines
  - a 35% increase in the number of batteries where no H_2S is vented
  - a 20% reduction in the volume of battery gas vented
  - improvement in flare reliability & efficiency
  - significant reduction in on-lease H_2S hazards & off-lease H_2S odours

2005 Gas Flaring & Venting

- Solution gas production – 17.5 $10^6 m^3$
- Average GOR – 18.4 m^3/m^3
- Solution gas disposition
  - Flared – 11.2 $10^6 m^3$ (64.0%)
  - Vented – 2.9 $10^6 m^3$ (16.6%)
  - Lease fuel – 3.4 $10^6 m^3$ (20.4%)

Flaring & Venting Reduction Barriers

- Low solution gas volumes
  - Average battery gas volume – 638 m^3/d
- No gas gathering or process infrastructure
- Poor economics for gas conservation
- Perceived regulatory barriers

Flaring & Venting Reduction Planned Activities

- Encourage gas conservation
  - expansion of SE Saskatchewan gas gathering system into Manitoba
  - Eliminate any regulatory barriers
  - Develop royalty/tax incentives to encourage companies to tie-in batteries
- Reduce vent volumes
  - Focus on recovery of stock tank vapours
  - new battery design & modifications to existing batteries