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EMISSIONS REGULATIONS AND REDUCTIONS TECHNOLOGY IN WESTERN CANADA'S OIL & GAS SECTOR

16/05/2017

- Process Ecology Introduction
- What Regulations are there?
- What is Canada doing about it?
 - Air Quality Management System (AQMS)
 - Global Committments
- Oil and Gas – How Big Is the Problem and What can we do about it?



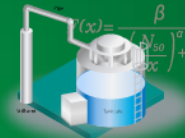
CORE COMPETENCIES



Process Engineering
and Optimization



Emissions Estimation
and Management



Advanced Modeling
and Simulation



Software
development



PROCESS ECOLOGY



Founded 2003, Calgary, AB

Engineering consulting, process simulation & optimization, software development, air emissions estimation and management

Track record of advanced modelling, simulation and process design, combining and extending simulators and rigorous engineering calculations to handle complex scenarios



PROCESS ECOLOGY

- Methane – CH₄
- Greenhouse Gases – CO₂, N₂O, HCs
- Risks to Human Health
 - Short Lived Climate Pollutants: Black Carbon, Ozone, Particulate Matter and others
 - Benzene



Methane – CH₄

- **Alberta – reduce 45% from 2012 by 2025**
 - New facility standards Directive (mid 2018?)
 - Measurement Monitoring and Reporting(MMR) (2018?)
 - Leak Detection and Repair (LDAR) (2018?) – already in US
 - Voluntary Joint Initiative – reduction and verification
- **BC – reduce 45% by 2025**
 - Target fugitive and vented emissions – legacy facilities
 - Offset protocol/clean infrastructure royalty credits – new facilities
 - Mandatory LDAR & others – post 2018
 - Supporting Efficient Engines, supplying clean LNG



Methane

- Saskatchewan
 - No specific provincial regulation
- Federal – reduce 40-45% below 2012 by 2025
 - Regulation Timing – adjusted (was 2020, now 2023)
 - LDAR
 - Compressors – seals and rod packing vents
 - Well Completions – prohibit venting
 - Process Venting – limit totals, dehy capture requirements
 - Pneumatics – low or no emissions



GHG

- **Alberta**

- SGRR: >50,000 tonnes/yr CO₂e, must report
- SGER: >100,000 tonnes/yr CO₂e:
 - Reduce Emissions Intensity 20% per year by:
 - Improving Operations
 - Purchase Offsets - \$30/tonne in 2017
 - Emission Performance Credits from Previous period
 - Replaced by Carbon Competitiveness Regulation by 2018
- Carbon Tax: \$20/tonne CO₂e in 2017; \$30/tonne in 2018
 - Charged on fuel imported, sold, flared and vented in Alberta
 - Natural Gas produced and consumed ON SITE - exempt



GHG

- BC

- GHG Industrial Reporting and Control Act – Climate Action Secretariat
 - GHG Emission Reporting Regulation
 - >10,000 tonnes/yr CO₂e must report
 - GHG Emission Control Regulation
 - > 25,000 tonnes/yr CO₂e must report and verify
 - GHG Emission Penalties and Appeals
 - Use Western Climate Initiative (WCI) rules to calculate
 - Concept of Linear Facilities
- Carbon Tax
 - Oil and Gas pay on all combustion of fuels



GHG

- Saskatchewan

- No specific regulation
- Focus on
 - Carbon Capture and storage
 - Decarbonizing Power System

- Federal

- Greenhouse Gas Reporting Program (GHGRP) – since 2004
 - >50,000 tonnes/yr CO₂e must report – may change to >10,000 tonnes/yr CO₂e in 2018 or 2019 – MANY more facilities will report
 - Carbon Tax – minimum \$10/tonne CO₂e, currently in negotiations with provinces.



Other Air Emissions

- **Federal – NPRI (National Pollutant Release Inventory)**
 - Air, Water and Ground
 - Full reporting only at > 20,000 man-hours/yr (Under Review)
 - Smaller facility reporting: Part 4 and 5 only
 - Particulate Matter
 - SO_x
 - NO_x
 - VOCs
 - CO
 - NH₃
- **Alberta/BC/Saskatchewan – Benzene Reporting**
 - Type I Carcinogen
 - From Dehydrators: Alberta Directive 39, BC Oil and Gas Operations Manual Appendix J; Saskatchewan Directive S-18



Flaring and Venting (F&V)

- Source of GHG, Methane and Other Gases
- Alberta
 - Directive 60 – rules about F&V, especially conservation of solution gas
 - Also reported in various ways through Petrinex according to rules in Directives 7, 17 and 76
- BC Oil and Gas Commission (OGC)
 - Flaring and Venting reduction guideline – eliminate all routine flaring by 2016 (?)
- Saskatchewan
 - Directives R01, S-10, PNG017 and S-20



AQMS – Federal Initiative (Except Quebec)

- Canadian Council of Ministers of the Environment – 2012
- Comprehensive approach to reducing air pollution
- **Canadian Ambient Air Quality Standards (CAAQS)**
 - Canadian Environmental Protection Act (1999)
 - Newly reduced limits on PM2.5 and Ozone
 - Human health impacts – respiratory (Particulates and Smog)
 - Aspirational Targets to Drive Improvements -
 - Benzene Targets
 - SO2 at ground level from flaring of acid gas



- **BLIERS – Base Level Industrial Emission Requirements**
 - Major Industrial Emitters
 - Ensure Good Base-Level Environmental Performance
 - Minimum Performance Standards
 - Oil and Gas must follow the MSAPR – Multi-Sector Air Pollutant Regulations
 - Limits on NO_x from large combustion sources (Boilers, heaters, stationary engines)
 - Future limits on SO₂, VOCs, NH₃ and PM likely



- Provincial and Regional

- Directives as indicated above
- Special Air quality management areas – e.g. Peace River
 - AER Directive 84 – HC Emission Controls and Gas Conservation Peace River Area – effective April 1, 2017
- Provincial Guidelines:
 - Alberta
 - Substance Release and reporting Regulations under EPEA (Environmental Protection and Enhancement Act)
 - Alberta Ambient Air Quality Objectives (AAAQO)
 - BC
 - Oil and Gas Waste Regulation
 - Air Quality Objectives (BC AQO):
 - PM10, PM2.5, Ozone, SO2, NO2, Formaldehyde, TSP (total Suspended particulate)
 - Saskatchewan
 - Environmental Management and Protection Act and Regulations
 - Focus on SO2, NO2, PM2.5, PM10, CO and VOCs



• AIR doesn't respect BORDERS

- Conference of the Parties - recently COP21 (Paris, 2015) and COP22 (Marrakech, 2016)
 - Reduce HFCs
 - Reduce Aviation Emissions
 - Ratification of Paris agreement – limiting global warming
 - Carbon Tax Commitment
- United Nations Environment Programme:
 - Canada a founder of CCAC – Climate and Clean Air Coalition
 - Focus on Short Lived Climate Pollutants (SLCPs):
 - Black carbon, ozone, methane, HFCs
 - Targeting Transportation, Electric generation, Oil & Gas Methane, HFCs, AQMS



- **Global Methane Initiative (GMI)**
 - Voluntary, Canada co-chairs Oil and Gas Subcommittee
 - Canada focusing on:
 - Oil & Gas
 - Landfills
 - Agriculture
 - Global alliance for Clean Cookstoves
- **Global Gas Flaring Reduction Partnership (World Bank) (Alberta)**
 - Public/Private
 - Research, Best practices, Regulatory work
- **United Nations Economic Commission for Europe**
 - Best practices on reducing emissions
- **Arctic Council**

- **Federal Estimates**
 - 2015 (most Recent): 189 Mt CO₂e - 26% of national emissions (NIR to UNFCCC)
 - GHGRP – reports only 81 Mt CO₂e (only facilities that are large)
- **Alberta:**
 - Methane: 31.4 Mt CO₂e as Methane, 70% of provincial CH₄ emissions
- **REFERENCE:**
 - 722 Mt CO₂e – Canada's Total GHG Emissions in 2015
 - ~50,000 Mt CO₂e – Worldwide Total



- Clearstone Report – (2011 data) and Current Alberta Government:

GHG Source	% of Total
Fuel Combustion	59.8%
Fugitive Equipment Leaks	11.9%
Reported Venting	10.4%
Unreported Venting	9.2%
Releases of Formation CO2	4.8%
Flaring	3.9%

Methane Source	% of Total (Clearstone)	% of Total (AB Govt)
Reported Venting	31.7%	48%
Unreported Venting	28.2%	
Fugitive Equipment Leaks	36.1%	46%
Other (Flaring, Tanks, etc.)	4.1%	6%



- **New Data (2017):**

- St. F.X – BC Montney Shale – 111,800 tonnes CH₄ annually
- Environmental Defence / Greenpath – Alberta Methane emissions from oil and gas could be 60% higher than originally thought (significantly more leaking equipment – unreported venting)
- Purdue University – refineries and Gas power plants – methane leaks 2-120 times higher than EPA estimates
- Environmental Sci & Tech (2015) – Natural Gas Processing and Gas Gathering – Actual Methane emissions substantially higher than current EPA estimates
- Many others – generally measurements are higher than estimates have been

- **Baseline**

- Hard to capture
- Factored estimates increasingly inaccurate
- Can't measure it all – 100,000+ sources in Alberta alone
- **NEED BETTER MODELS!**



- **First Targets?**
 - Fugitives
 - Venting
 - Combustion
- **Protocols**
 - Existing
 - Pneumatics
 - Solution Gas Conservation
 - Upcoming
 - LDAR (Leak Detection and Repair) ?
- **Best Practices**
 - CAPP Documents
 - CSA Z620.1
 - API Compendium
 - EPA's AP-42



- **WHAT** are the Regulations?
 - It's convoluted!
- **WHAT** are we **DOING** about it?
 - Federal initiatives
- **WHAT** is our place in the Global Picture?
 - World leader
- **HOW** Big is the Problem?
 - Numbers vary, hard to estimate
- **WHERE** to reduce?
 - Fugitives and Venting



- QUESTIONS?
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