

REDUCING EMISSIONS FROM PLANT FLARES

Paper #61



Industry Professionals For
Clean Air - Houston



Flare Emissions:

- Underestimated
- Underreported
- Underrated

Industry Professionals for Clean Air

- Experienced in the petroleum and petrochemical industry
- Concerned with the slow pace in achieving acceptable air quality in the Houston region
- Believe pollution can be reduced at a reasonable cost with existing technologies
- Base our recommendations on our industry experience
- Focused on industrial flares, a major source of air pollutants

Current Regulatory Approach

- EPA and TCEQ calculate flare emissions assuming ideal conditions
 - Assume 98 or 99% combustion efficiency based on an early 1980s experimental study
 - Flame combustion efficiencies are not measured directly
 - Crosswinds and steam assist are not accounted for (Both can decrease flare efficiency substantially)
 - Flare operating data are not normally reported

EPA Regulations

Require that flares operate:

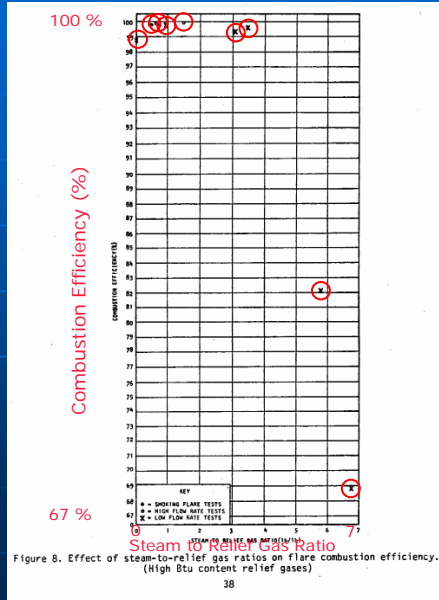
- With a flame present at all times
- With no visible emissions ... except for periods not to exceed a total of 5 minutes during any 2 consecutive hours
- To meet minimum heating value and exit velocity requirements

What Are the Issues?

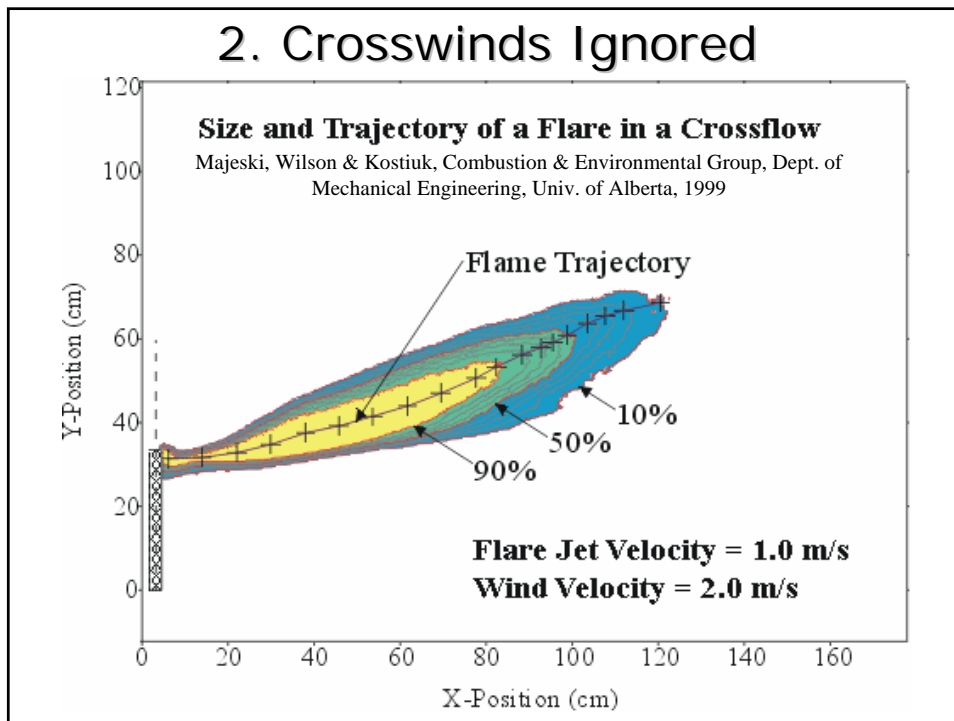
1. Steam assist gas ignored
2. Crosswinds ignored
3. Performance misinterpreted
4. Record-keeping inadequate

1. Steam Assist Gas Ignored

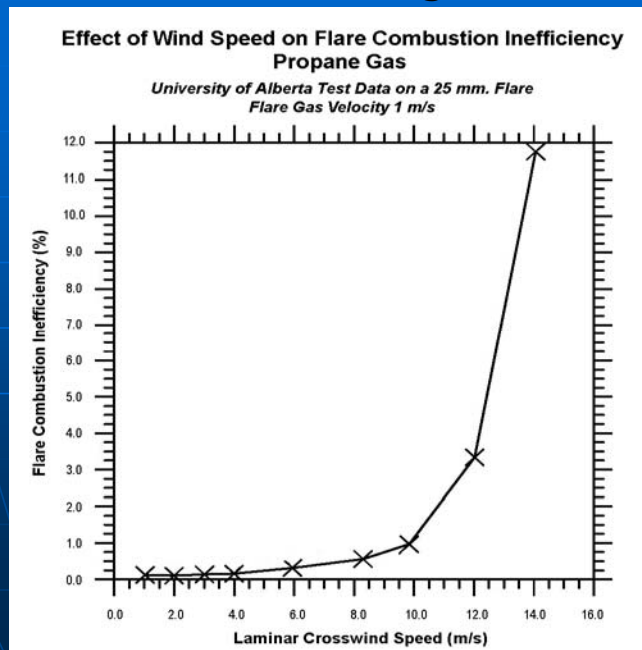
- EPA set default steam assist gas ratio in 1983
- Never adjusted or updated
- Not incorporated into regulations



2. Crosswinds Ignored



2. Crosswinds Ignored



3. Performance Misinterpreted

- Emissions during plant excursions underestimated
 - Hourly averaging can miss excursions
 - Weak evidence supporting 93% efficiency (93% efficiency allowed by TCEQ when heating value and exit velocity requirements are not met)

3. Performance Misinterpreted

- Inconsistent estimating methods
 - TX calculates HRVOC heating value hourly
 - from continuous flow rate and
 - from 15-min. composition measurements
 - CA measures heating value directly and continuously

3. Performance Misinterpreted

- CA requires continuous monitoring of flow rate and heating value
- CA requires state-of-the-art (ultrasonic) flow monitors
- TX now requires flow and composition monitoring of HRVOC streams
- TX monitoring is still inadequate
 - Non-HRVOC streams do not require continuous monitoring
 - Insufficient parameters for estimating and control

4. Record-keeping Inadequate

- Cannot prove continuous compliance with insufficient record-keeping
 - CA requires video recording of flares
 - TX does not require video recording
- On-line reporting helps reduce emissions
 - CA requires on-line reporting of flaring incidents
 - TX requires on-line reporting of upsets

What Are The Solutions?

1. Enforcement
2. Acknowledge known issues
3. Research uncertainties
4. Record-keeping and reporting
5. Explore alternatives

BAAQMD and SCAQMD Could Be Models

- Eliminate routine flaring
 - Require use of sulfur and heating value analyzers on flare streams
 - Require flare minimization plans (FMPs)
 - Require Web postings of flare incidents
 - Decrease emissions targets
- *Bay Area achieved 75% reduction in refinery flare emissions in 2 years*

1. Enforcement

- Stop token fines
- Focus public attention on flaring

2. Acknowledge Known Issues

- Recognize data from credible studies at Univ. of Alberta and elsewhere
- Eliminate arbitrary assumptions for combustion efficiencies
- Use realistic efficiencies considering crosswinds and steam assist

3. Research Uncertainties

- Combustion efficiency
 - Impact of crosswinds and assist gas
 - Other factors
- Flare monitoring technologies

4. Record-keeping and Reporting

- Require flare minimization plans like those required by BAAQMD
- Require specific cause analysis for significant flaring events
- Require monthly reporting of daily emissions and post to Web

5. Explore Alternatives

- Eliminate routine destruction of waste gases in elevated flares
- Allow flaring only for non-routine or emergency releases
- Encourage use of flare gas recovery systems
- Use other high efficiency options
 - Enclosed ground flares
 - Thermal oxidizers or incinerators

Conclusions

1. Recognize that high emissions from flares exist and are a fertile ground for achieving major reductions.
2. Seek ways to minimize flare utilization.
3. Encourage greater use of flare gas recovery systems and more effective destruction technologies.

Conclusions

4. Individual Responsibilities
 - This is not just a regulatory issue
 - Industry must reframe and rethink flare utilization, economics and emissions
 - Every individual has ethical and moral responsibilities to aggressively reduce air emissions



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