

REDUCING EMISSIONS FROM PLANT FLARES

Paper #61



Industry Professionals For
Clean Air - Houston



Flare Emissions:

- Underestimated
- Underreported
- Underrated

Industry Professionals for Clean Air

- Experience in petroleum and petrochemicals
- Concern for the slow pace in achieving acceptable air quality
- 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 by 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:

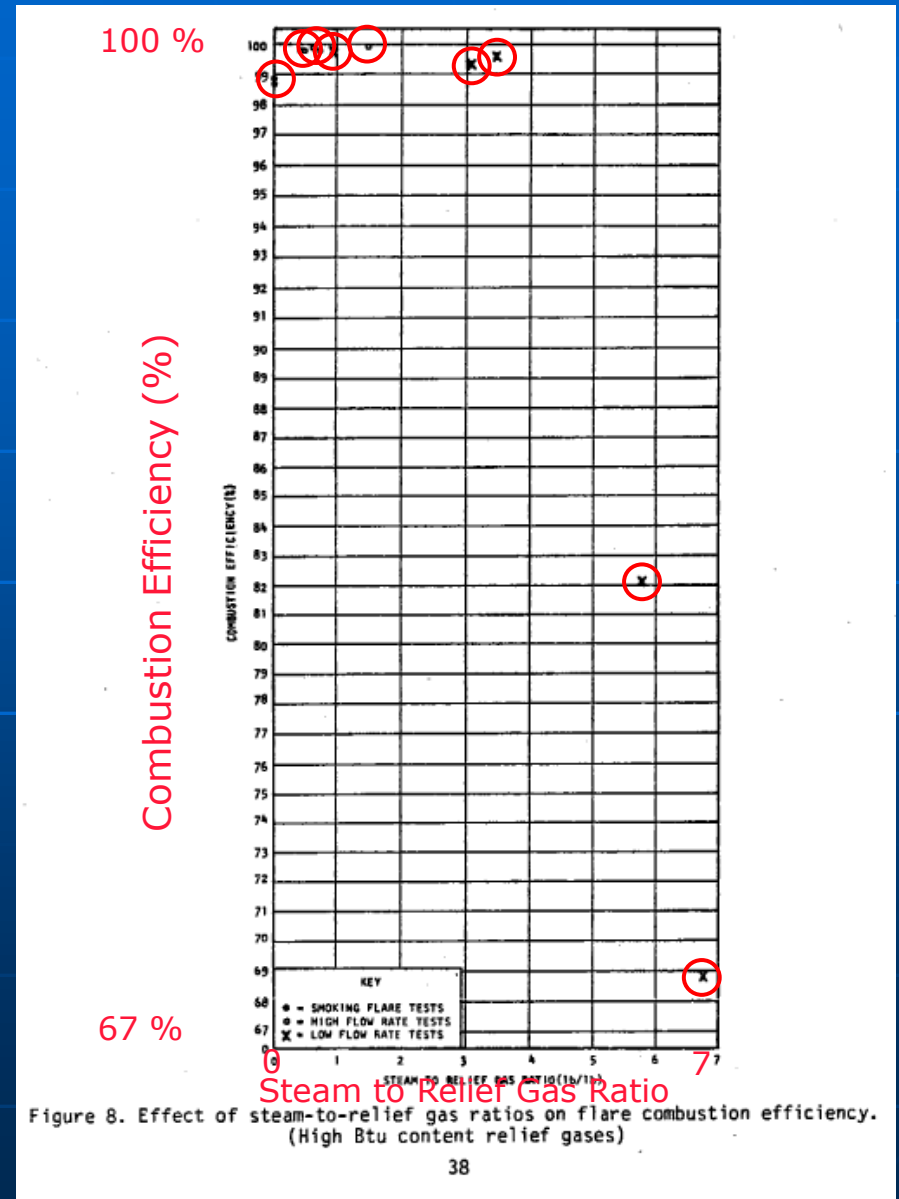
- With a flame present at all times
- With no visible emissions ... except for periods not to exceed a total of 5 minutes during any 2 consecutive hours
- To meet minimum heating value and exit velocity requirements

What Are the Issues?

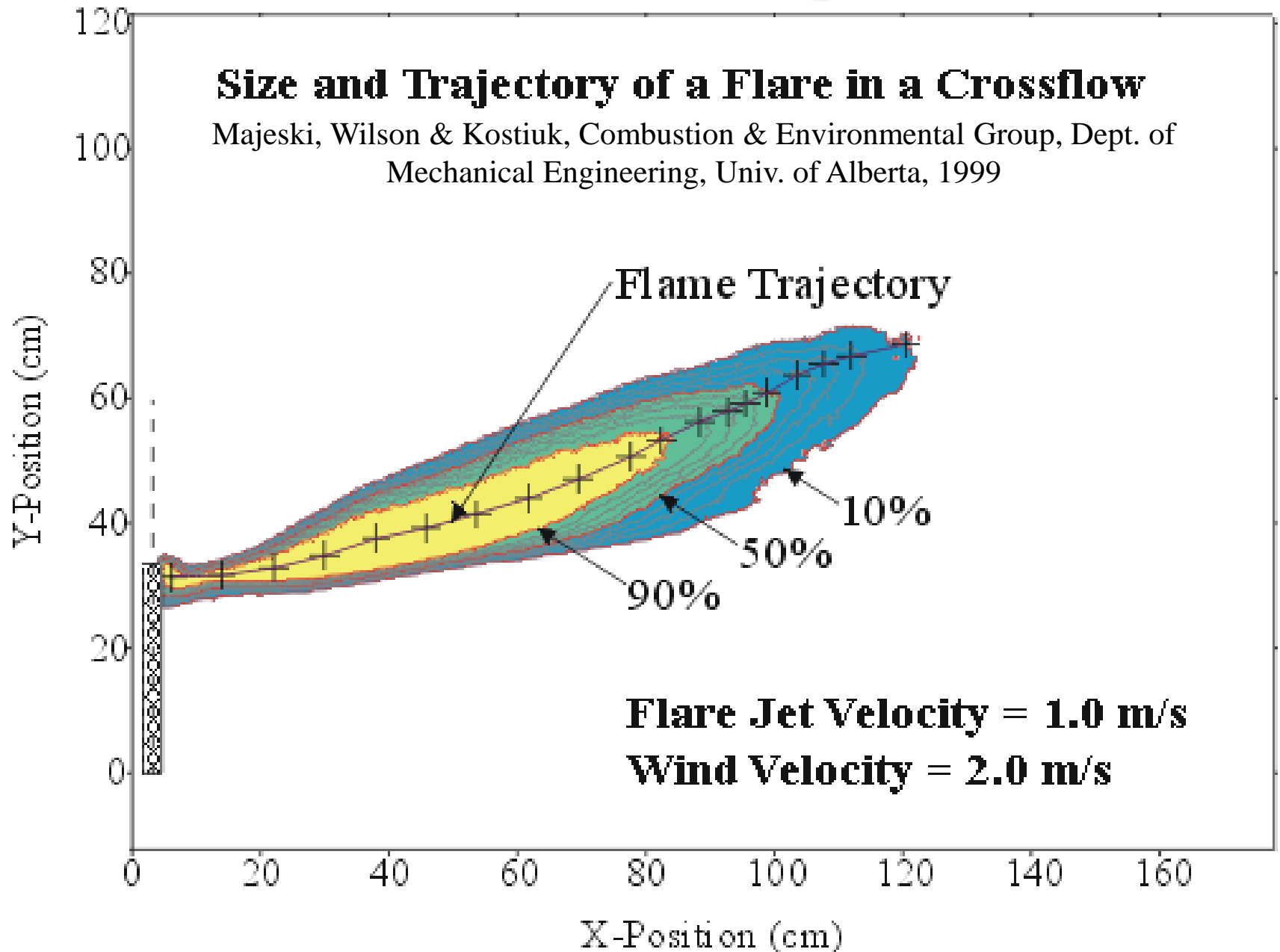
1. Steam assist gas ignored
2. Crosswinds ignored
3. Performance misinterpreted
4. Record-keeping and reporting inadequate

1. Steam Assist Gas Ignored

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



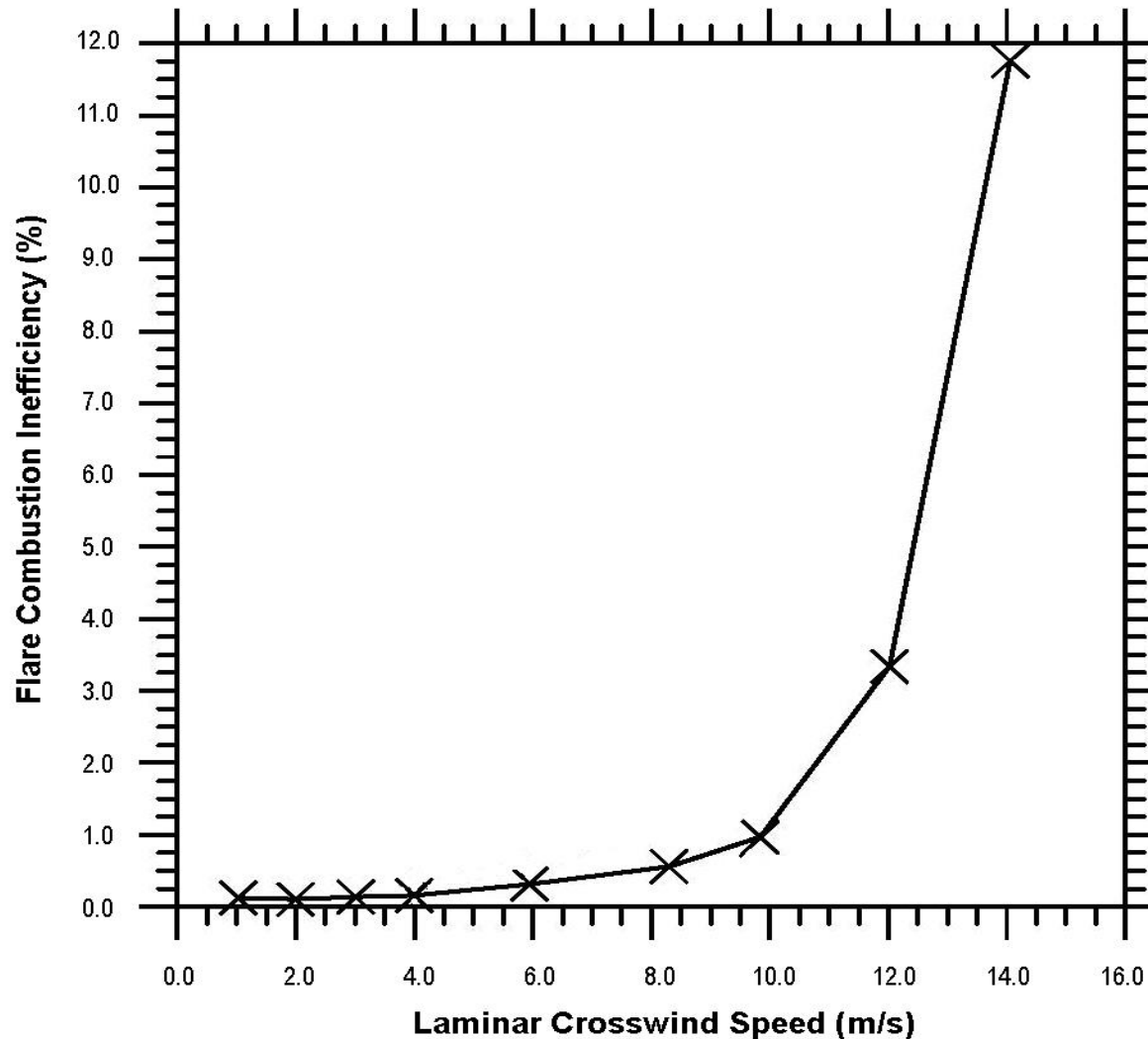
2. Crosswinds Ignored



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Effect of Wind Speed on Flare Combustion Inefficiency Propane Gas

*University of Alberta Test Data on a 25 mm. Flare
Flare Gas Velocity 1 m/s*



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
 - CA requires direct, continuous monitoring of flow rate and heating value
 - CA requires state-of-the-art (ultrasonic) flow monitors

3. Performance Misinterpreted

- Inconsistent estimating methods (cont.)
 - TX now requires flow and composition monitoring of HRVOC streams
 - TX calculates HRVOC heating value hourly
 - from continuous flow rate and
 - from 15-min. composition measurements
 - TX monitoring is still inadequate
 - Non-HRVOC streams do not require continuous monitoring
 - Insufficient parameters for estimating and control

4. Record-keeping & Reporting 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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