



**LASTFIRE**

**Update**

**2009**




**Large Atmospheric Storage Tank Fires**



**An industry consortium of international oil companies reviewing risks associated with storage tank fires**



# Member commitments

-  **Two Steering Group members**
-  **Questionnaire completion**
-  **Suggest issues for review**
-  **Advise coordinator on relevant issues / experiences**
-  **Host meetings**
-  **Encourage membership**



- **New LASTFIRE Website**
- **Incident Survey – Questionnaire**
- **WM Fuels LASTFIRE Test**
- **Vapour Suppression Work**

**LASTFIRE**

# New LASTFIRE Website



## LASTFIRE Project - Home Page

On behalf of a consortium of 16 oil companies a project was initiated in the late 1990s to review the risks associated with large diameter (greater than 40m) open top floating roof storage tanks. The project was known as the LASTFIRE project.

# www.lastfire.co.uk

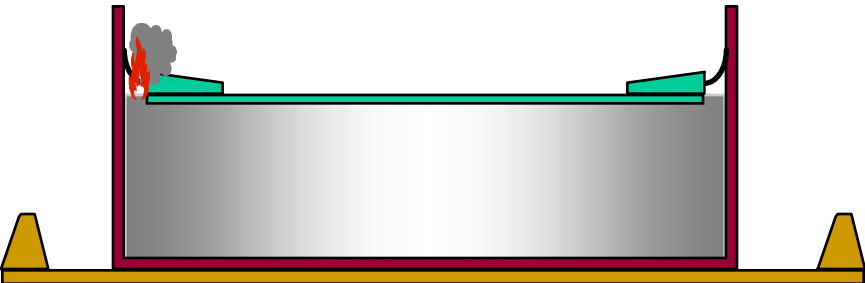
# LASTFIRE Incident Survey

- Atmospheric Tanks
  - OTFR
  - Internal Floating Roof
  - Fixed Roof
- Pressurised Storage
  - Bullets
  - Spheres

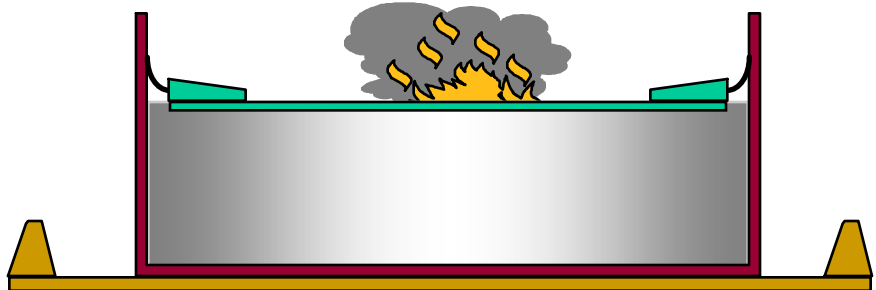
**Fires and spills**

**Available to members only!**

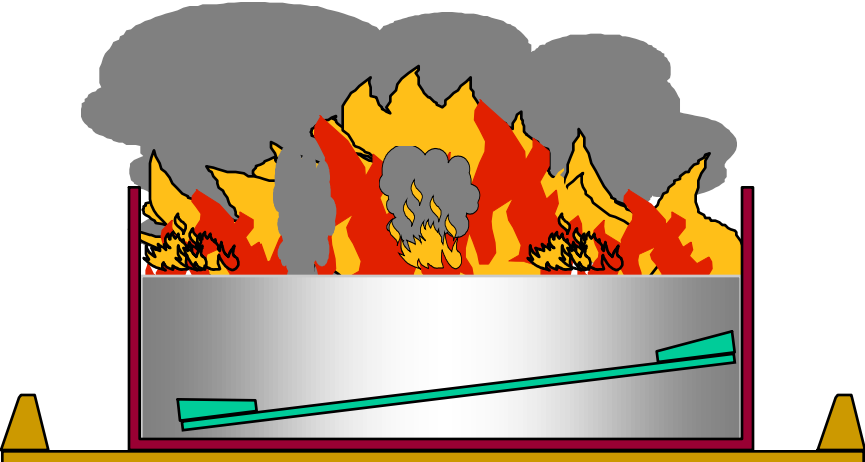
# FLOATING ROOF TANK FIRE SCENARIOS



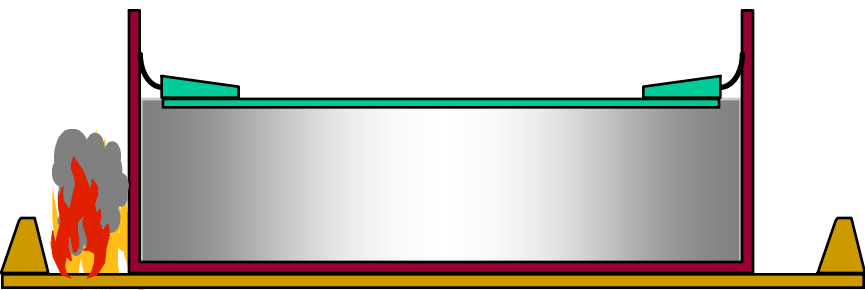
Rimseal Fire



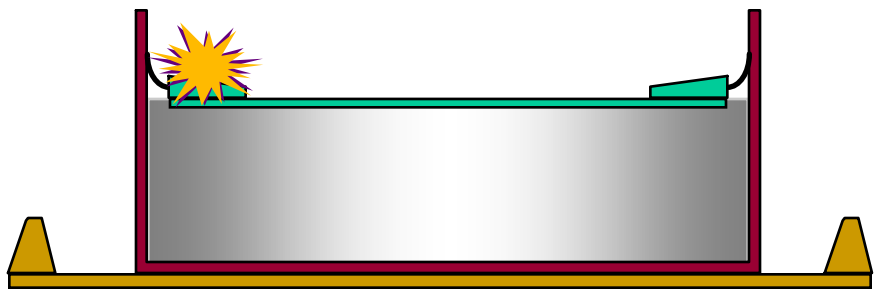
Spill on Roof Fire



Full Surface Fire



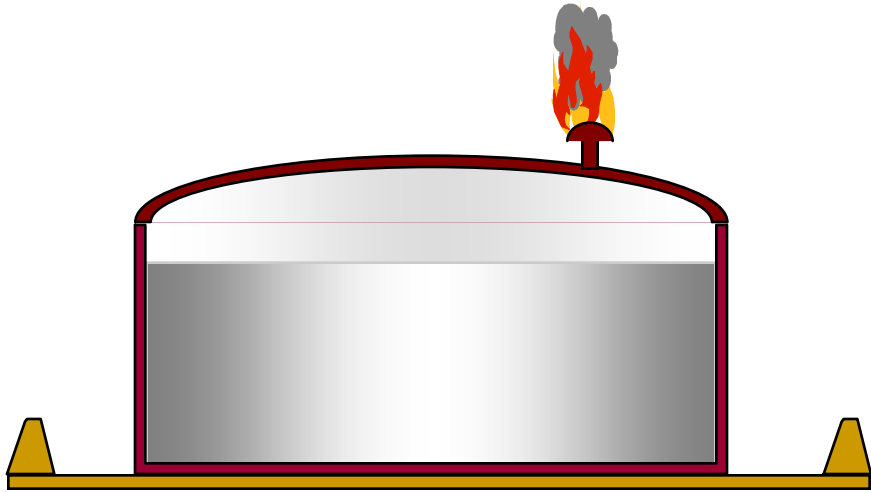
Bund Fire



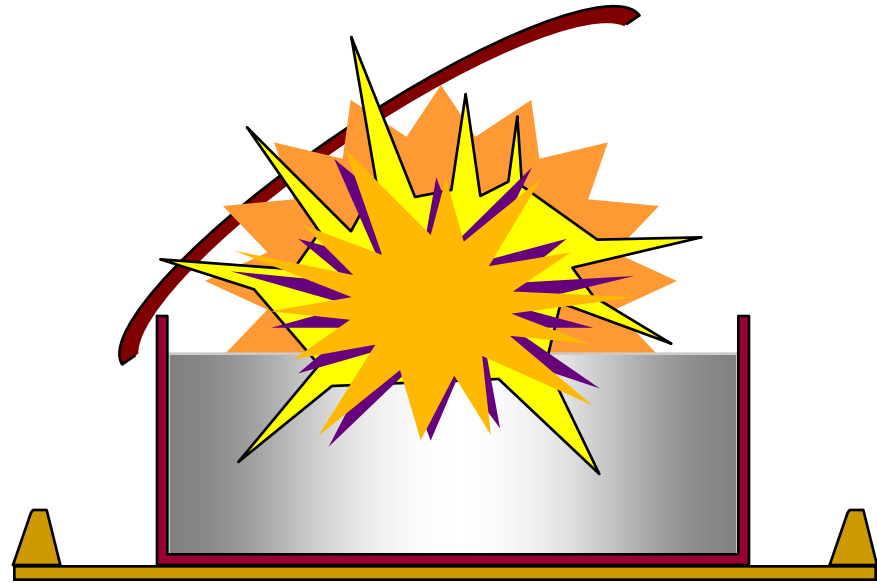
Pontoon Explosion



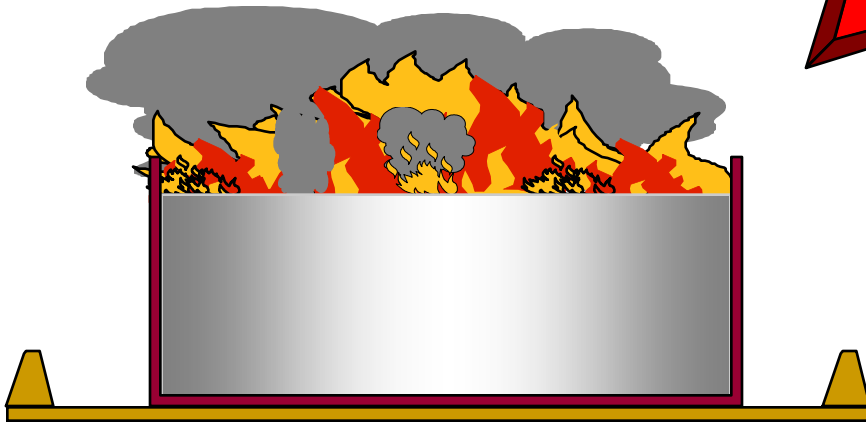
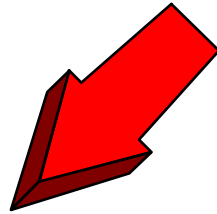
# FIXED ( CONE ) ROOF TANK FIRE SCENARIOS



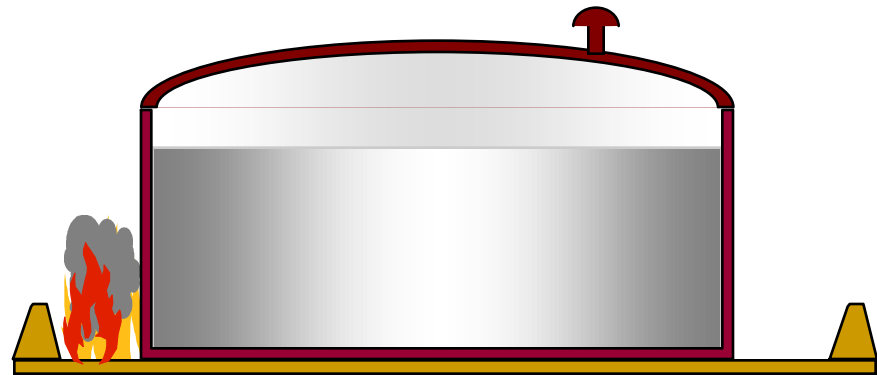
**Vent Fire**



**Vapour Space  
Explosion**

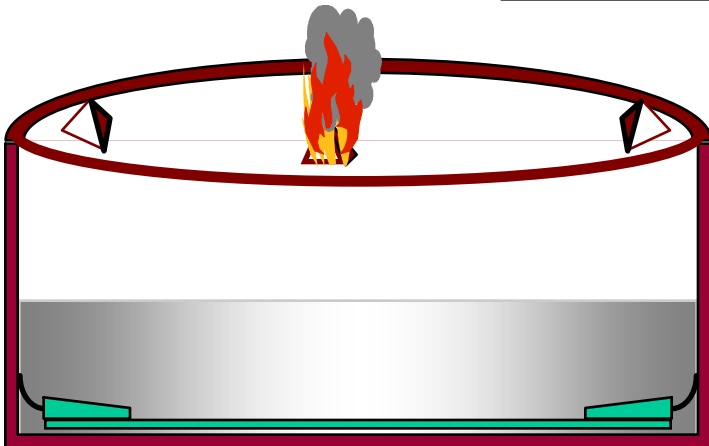
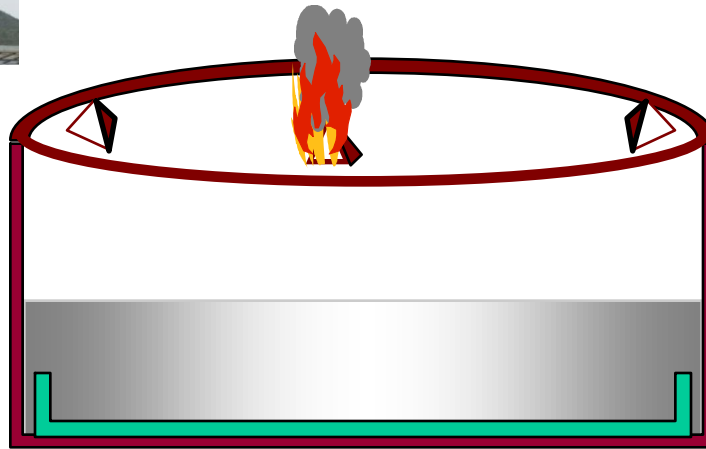
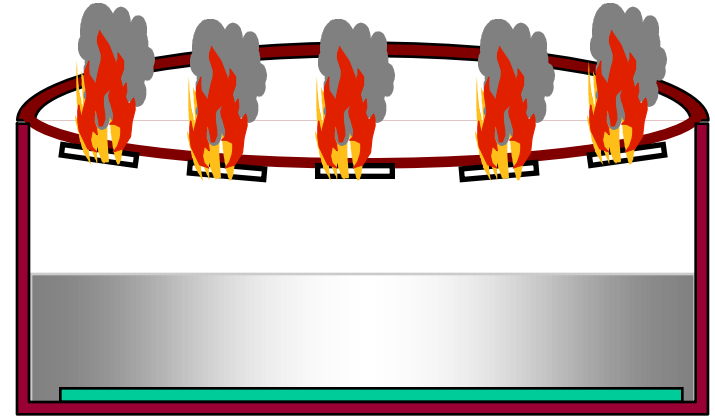


**Full Surface Fire**



**Bund Fire**

# INTERNAL ( COVERED ) FLOATING ROOF TANK FIRE SCENARIOS



**Vent Fires**

A large fire is burning on a paved area, with thick black smoke rising into the sky. The fire is contained within a circular or semi-circular boundary marked by red blocks. In the background, a train and a plane are visible. A tall light pole stands on the right side of the image.

# **LASTFIRE BOILOVER STUDY**





# Basic Analysis



- Time to boilover
- Effect of water/fuel quantity
- Fire spread
- Tank wall temperatures
- Effect of crude composition
- Refined products / Biofuels
- Model validation
- Foam application vs time


# Basic Analysis



- Multi boilovers possible
- Hot zone  $>2\text{m/hr}$
- Spread  $>10\text{d}$
- Tank wall temperature or noise not definitive guides



# Future study



- Cooperate with IFIF – Rotterdam
- Methods of delaying boilover
- Methods of preventing boilover
- Test to be carried out March 2010
  - Additives
  - Surface covering
  - Effect on foam application



# LASTFIRE



## WM Fuels LASTFIRE Foam Test Development





# Objectives

- To develop the long established LASTFIRE Foam Test for Storage Tank Fires methodology to suit assessment of foams on polar solvents and water miscible (WM) fuels
- To establish test parameters / methodology
- To establish best application rates
- To trial test equipment
  - Nozzles
  - Pan / backboard







# Outcome

- Testing has established:
  - Preburn time – 3 minutes
  - Foam application durations – 7 mins
  - Application rates
  - Vapour seal testing
  - Burnback methodology
  - Equipment usage
  - Nozzle performance

**Full specification developed**



# LASTFIRE



## Vapour Suppression Research



# Initial Objectives

- Measure vapours above unignited pools
- Effectiveness of low expansion foam on vapour suppression (different types e.g. FP/MP)
- Effect of foam quality
- Effect of application rate
- Effect of solution strength
- Effectiveness over time

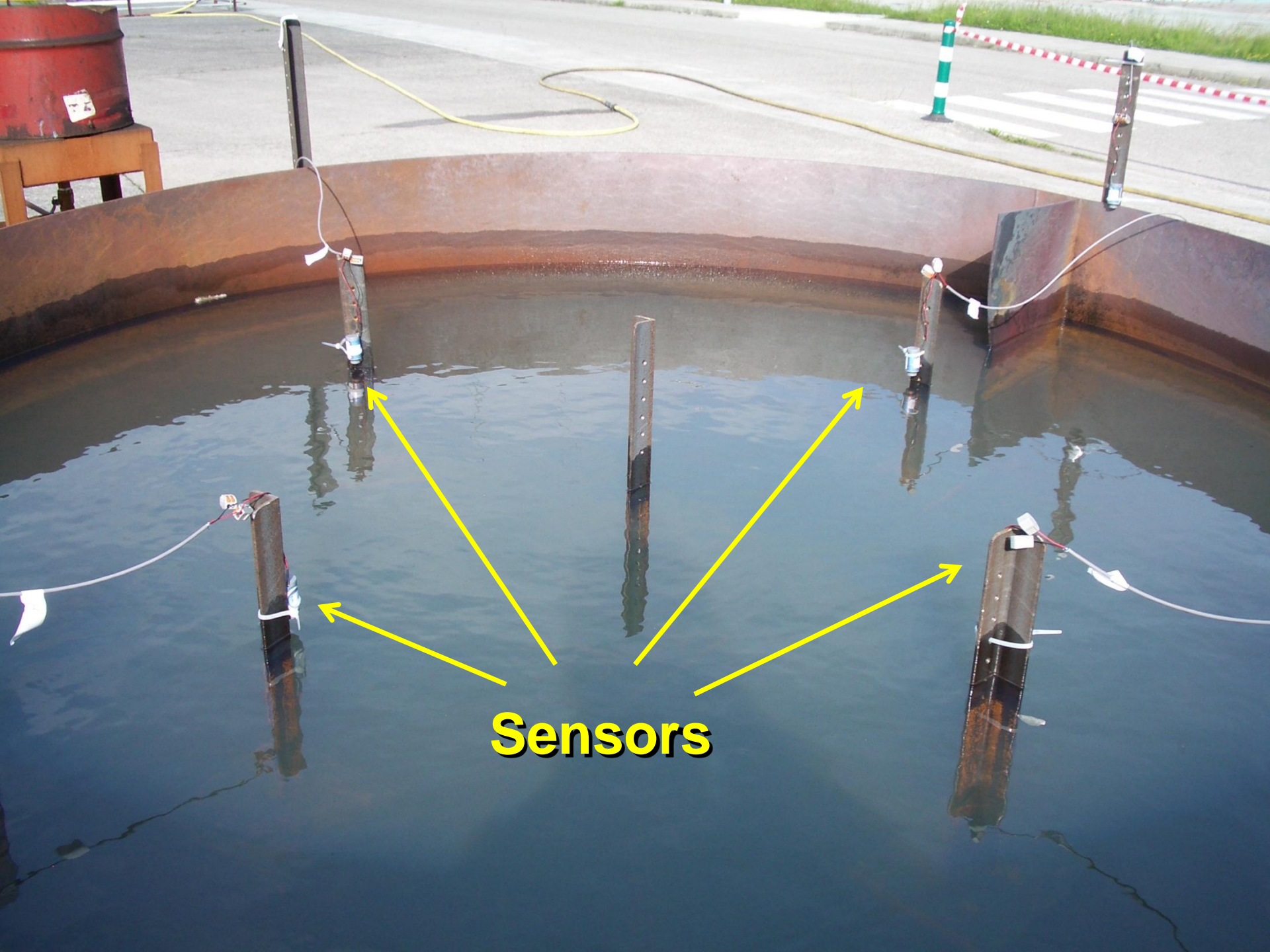




**Gasoline**

**LASTFIRE Tank  
(2.44m diameter)**





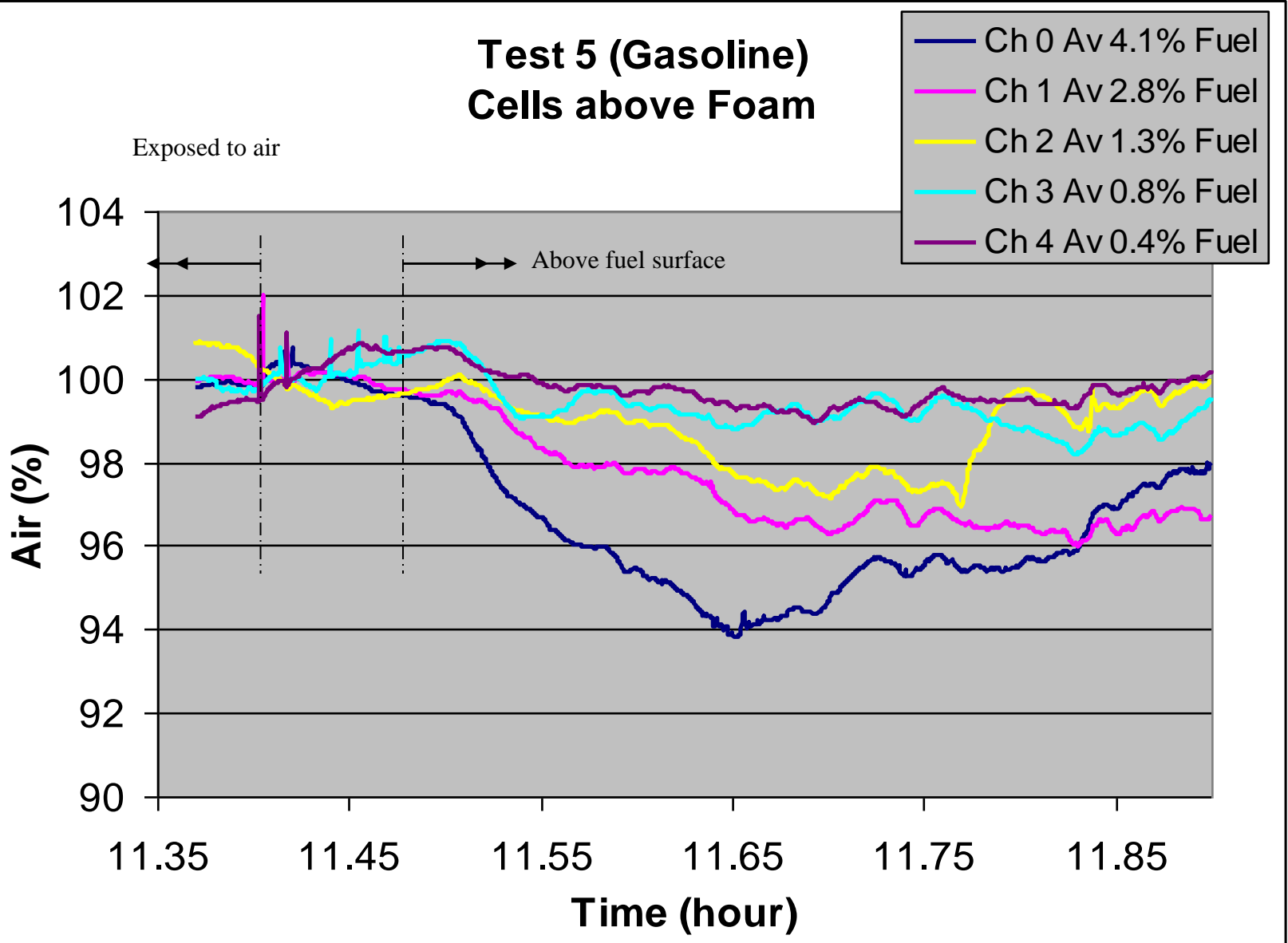
**Sensors**





# Oxygen Cells Test 5

## Test 5 (Gasoline) Cells above Foam





**“Handheld”  
(personal) LEL  
monitor used with  
lance / aspirator**



# Foam Application (Monitor nozzle)





**Measurements made throughout  
foam deterioration – up to 3 hours +**



# Observations

- FP based and MP foams appear effective at reducing vapour concentration above pool and around tank to  $<20\%$  LEL for periods in excess of normal drainage time of foam solution
- Wind a big factor in destroying blanket and possibly vapour suppression once foam solution has drained.
- Only severe agitation of foam blanket appears to reduce suppression effectiveness





# Hot Fuel Test – October 09

- How will foams suppress vapours on hot fuels?
- What top-up period?
- Drainage time vs. vapour suppression
- Gasoline used
- 3 minute preburn
- Foam application until extinguishment only







# Hot Fuel Test – Findings

- Foam rapidly cooled fuel even after a 3 minute preburn
- Fuel temperature in the order of 35°C
- Less than 2% LEL measured for over 2 hours
- Foam still very effective at reducing vapour concentration above the pool, as in the cold fuel test

**Full findings only available to Lastfire Members**



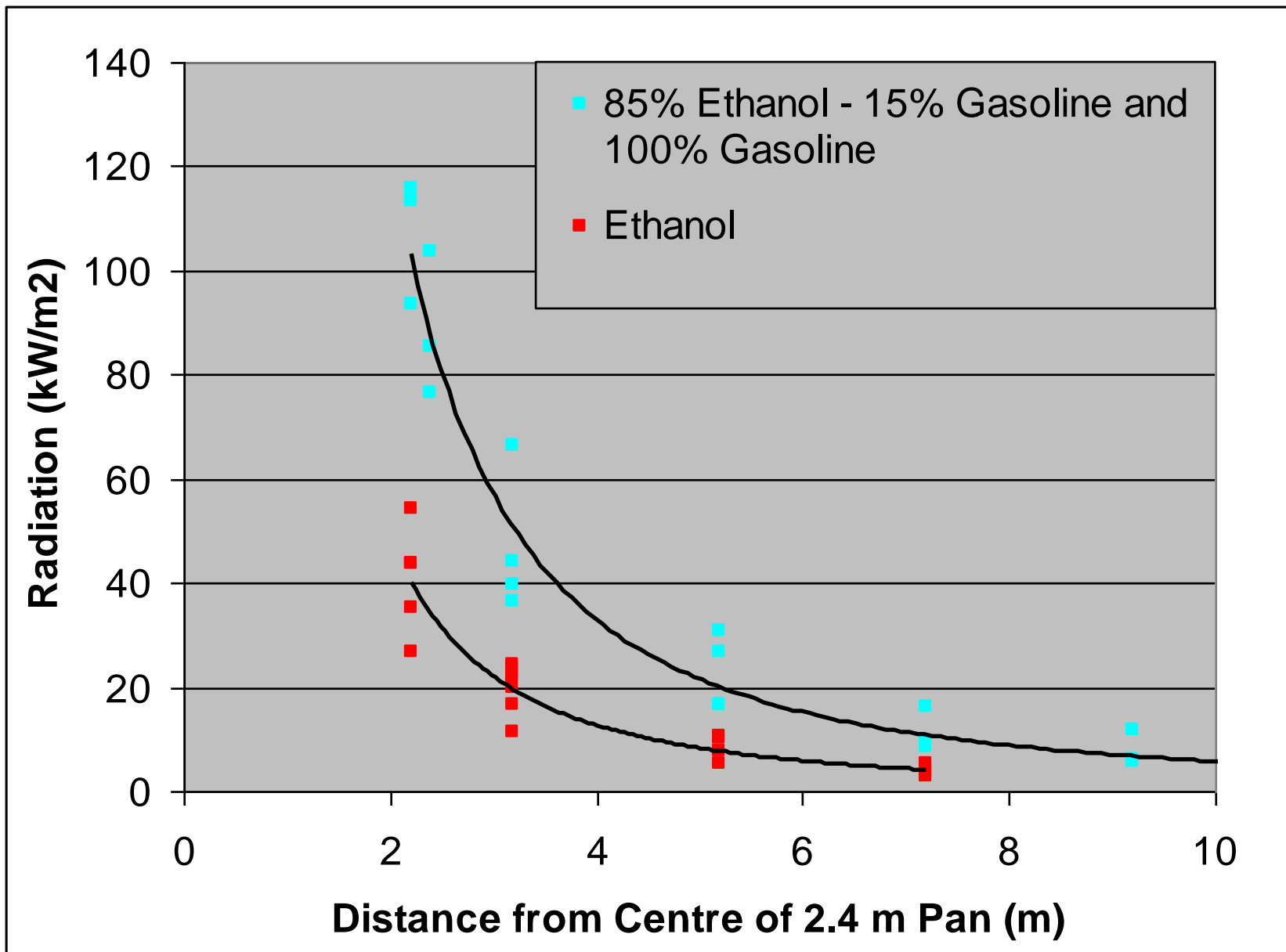




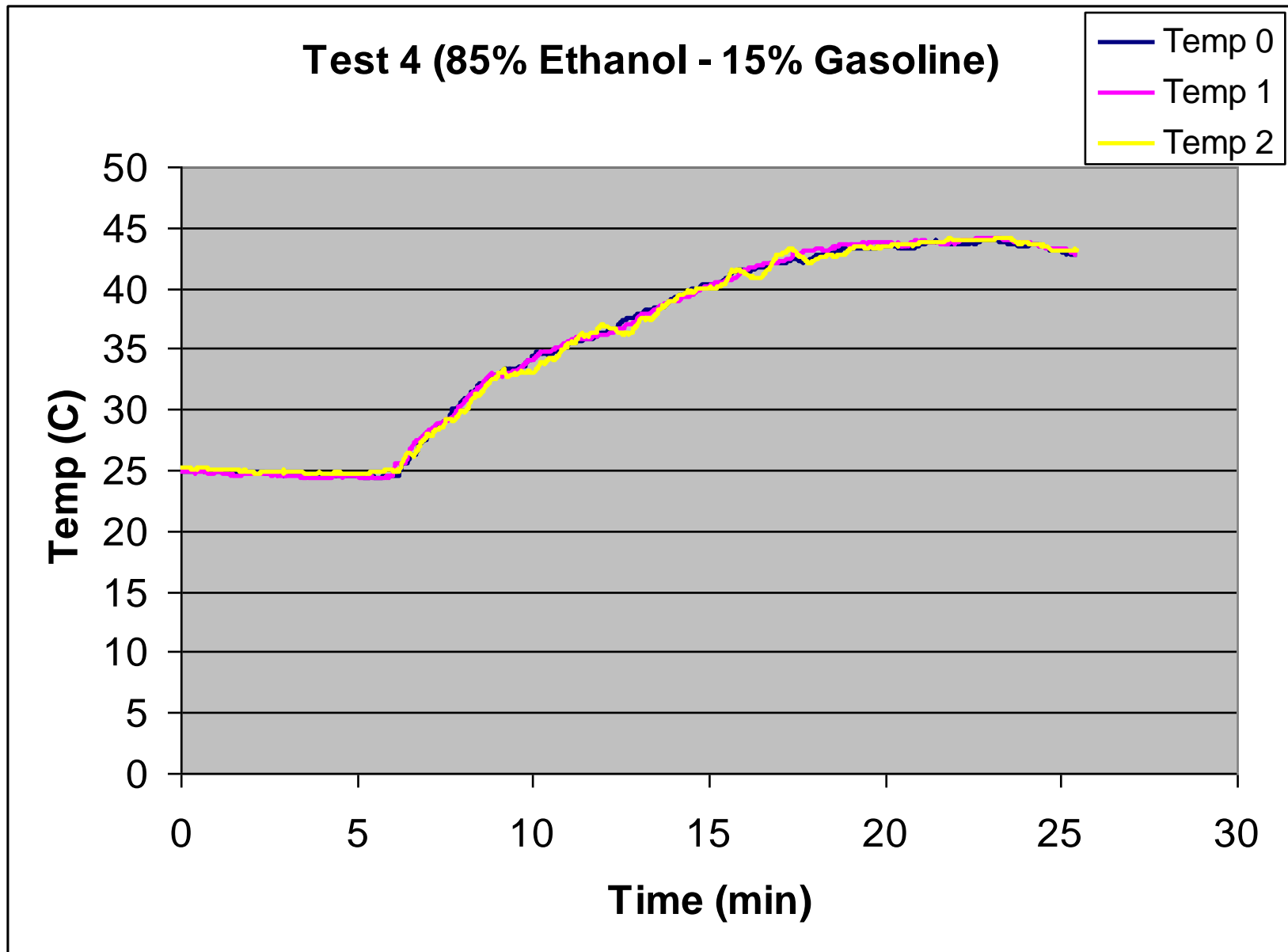
# Measurement of Incident Radiation



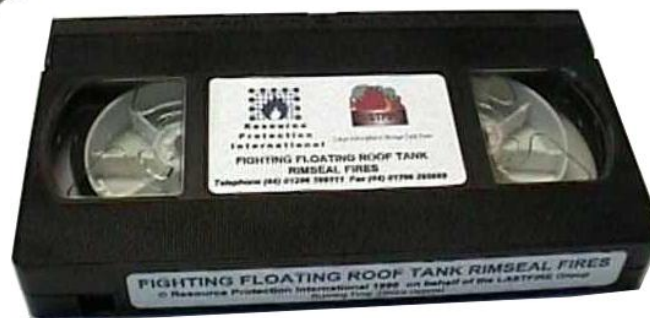
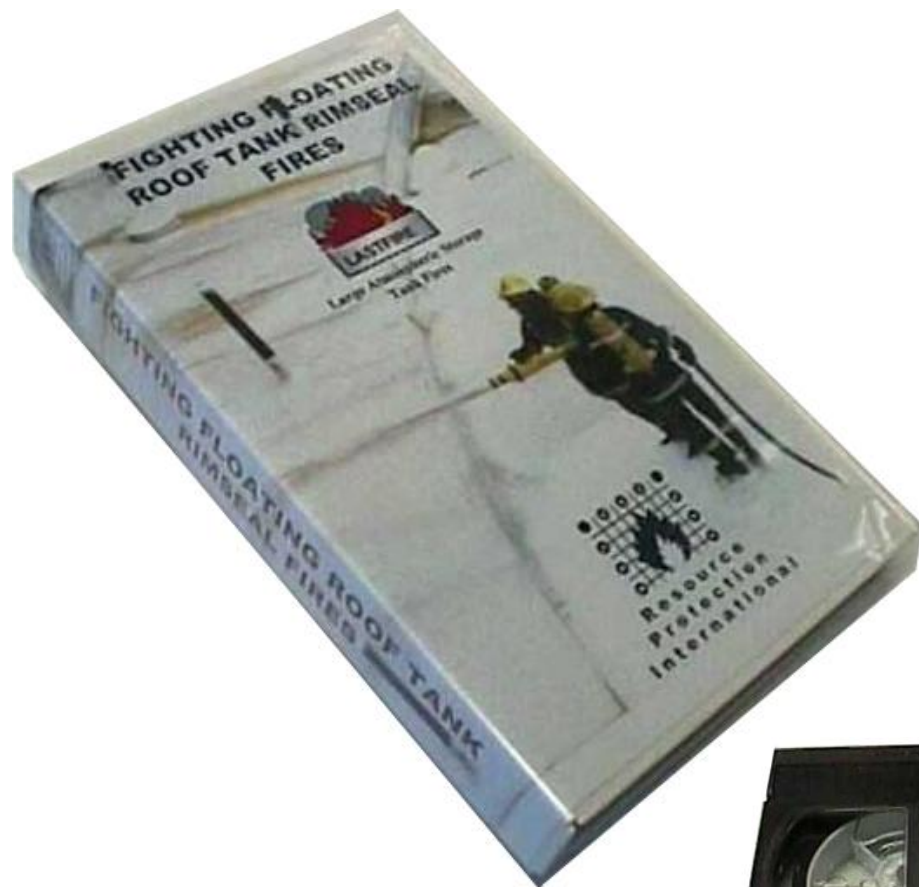
# Compilation of Incident Radiation Measurements Tests 3, 4, 6, 7, 8, 9 and 10



# Temperatures in Small Tank Test 4



# Fighting Floating Roof Tank Rimseal Fires



























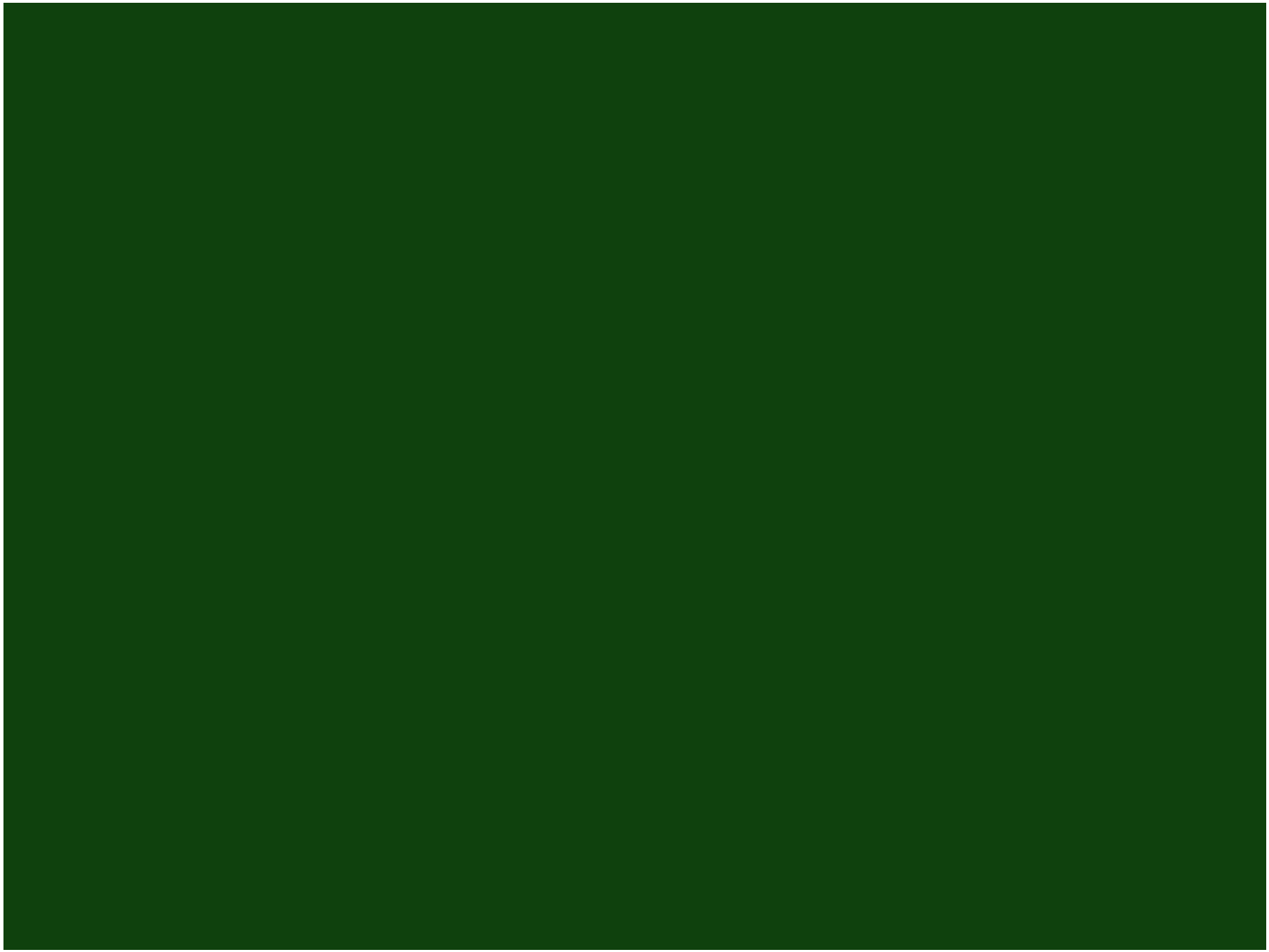














**More Information about LASTFIRE Deliverables  
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