

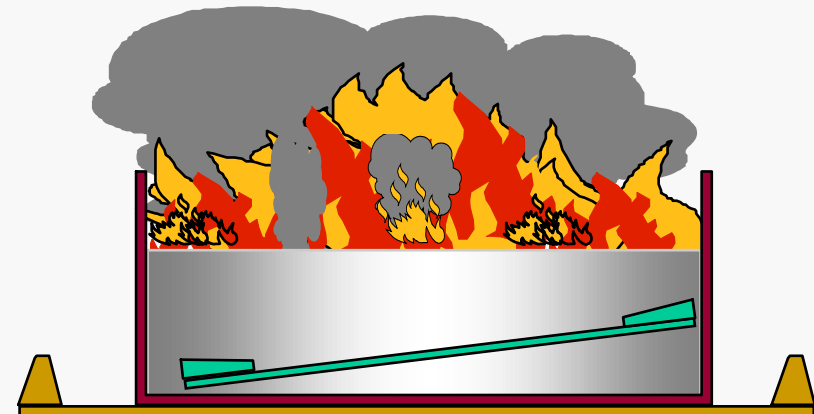
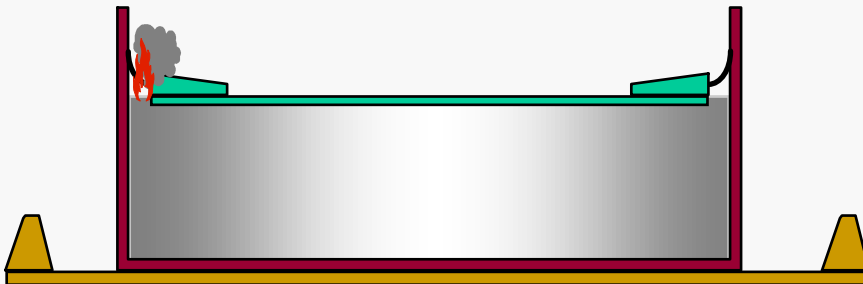


**Developing best practice guidance in storage tank
Fire Hazard Management**

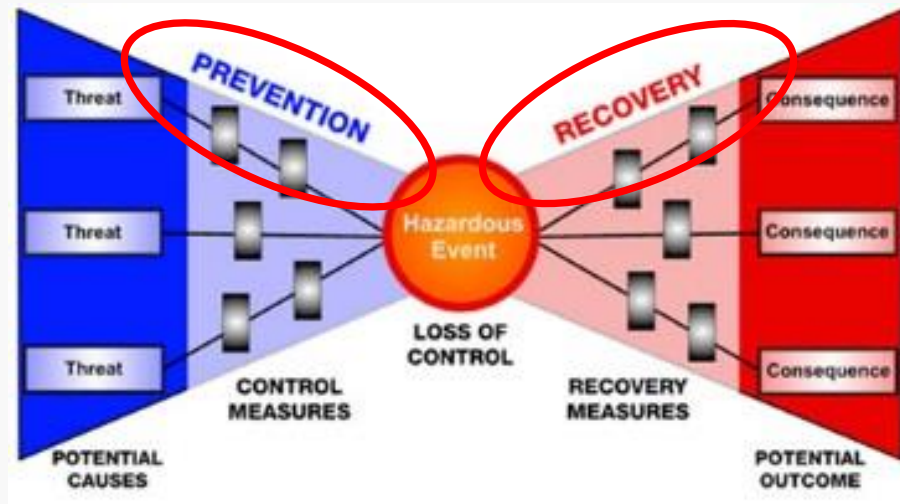
The Organisation

A Joint Industry Project

A consortium of international oil companies developing best industry practice in storage tank **Fire Hazard Management** through operational feedback, networking, incident analysis and research



Fire Hazard Management



Both sides of the bow tie!

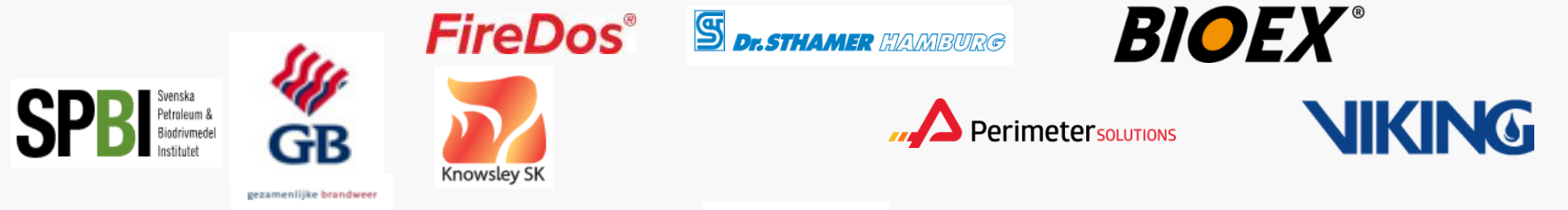


Current Members

Full members



Associates



Project Coordinator



The Origins



To develop a true understanding of the risks associated with fires in large diameter open top floating roof tanks

Original Project Structure

Sponsors'
Steering Group

One member per company

Project
Co-ordinator

Project
Working Group

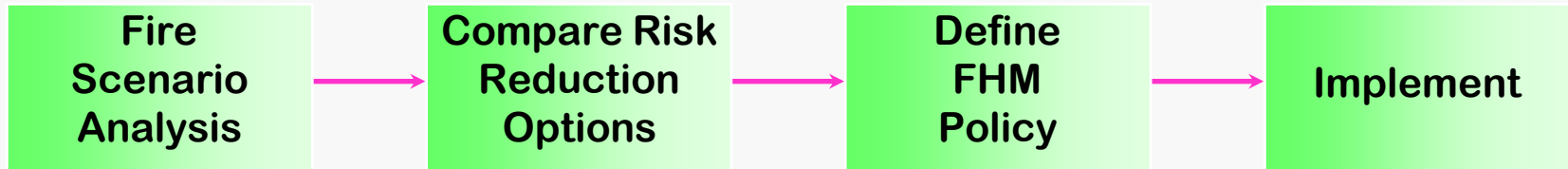
External Information Sources

- Operators
- Tank Builders
- Seal Manufacturers
- Detection Suppliers
- Protection Suppliers
- Fire Fighters
- Legislators
- Insurers

Project Co-ordinator

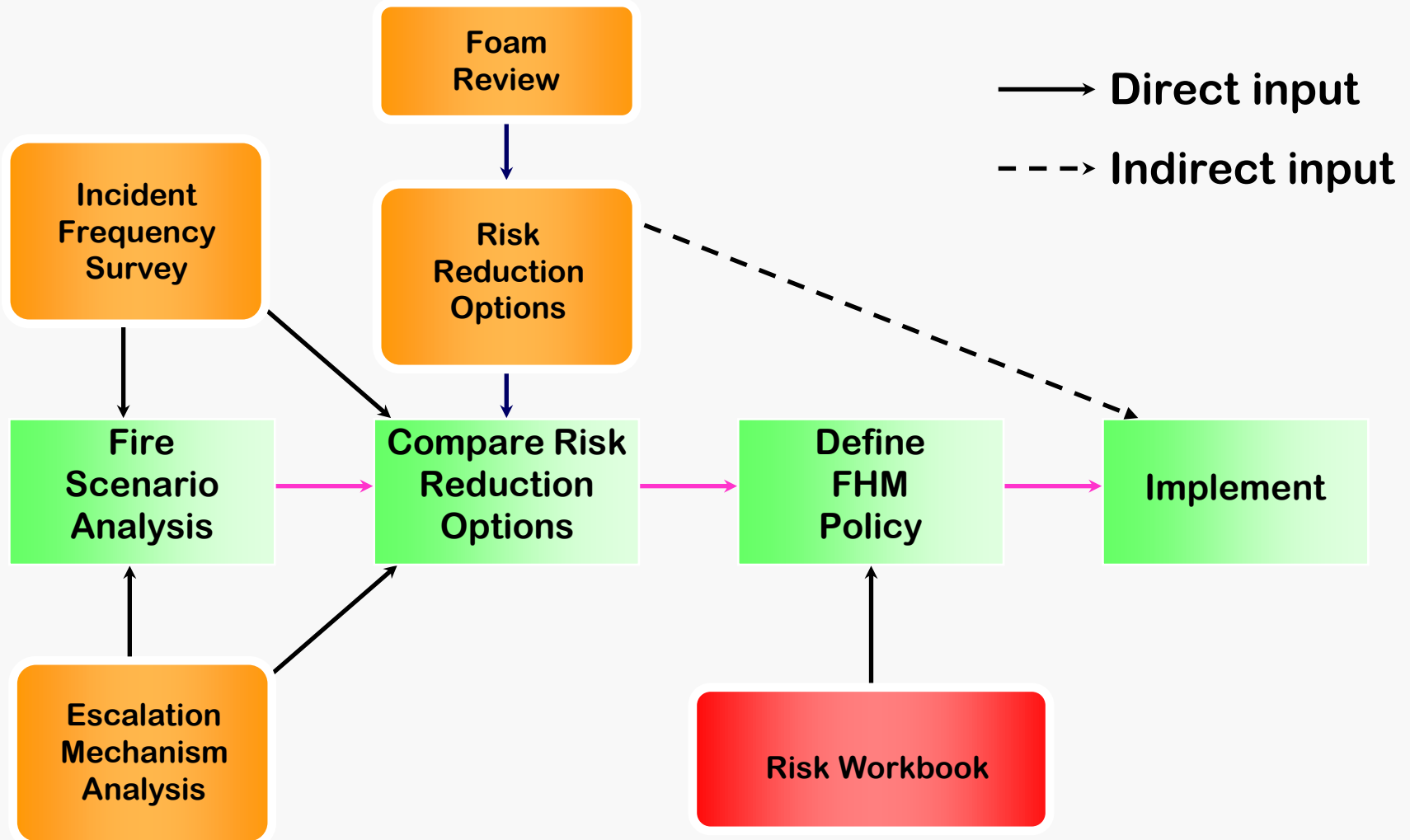


Project Deliverables



Fire Hazard Management Process, Energy Institute Model Code of Safe Practice Part 19

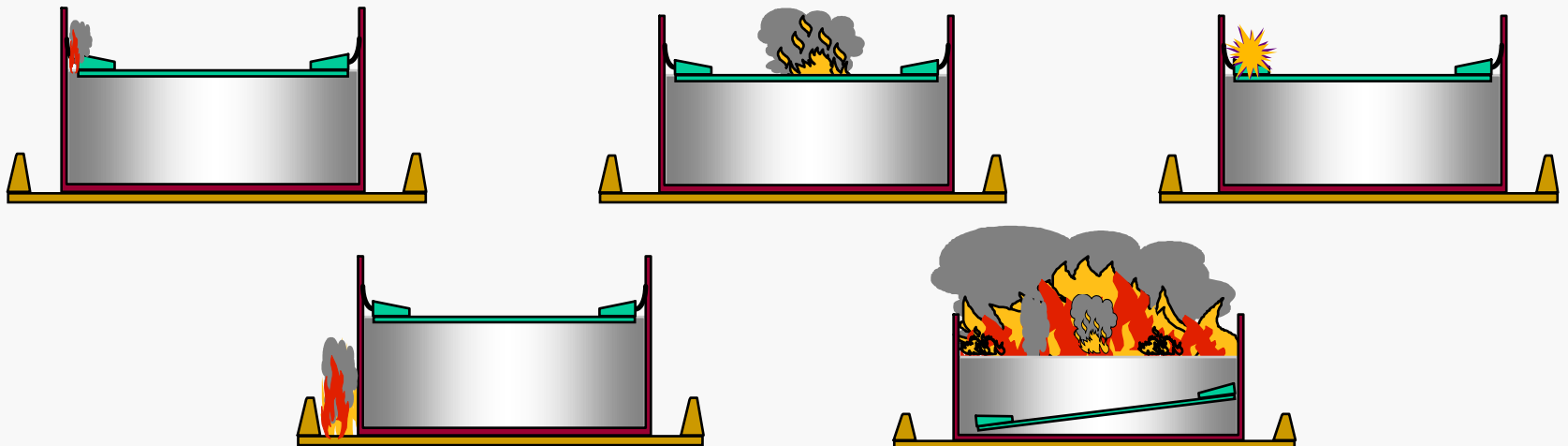
Project Deliverables



Project Deliverables

Incident
Frequency
Survey

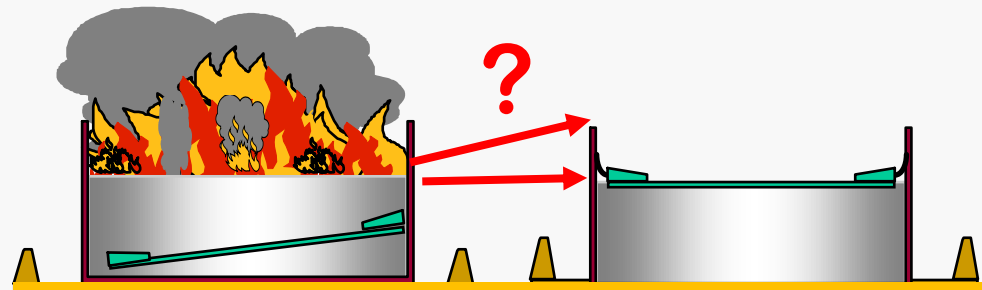
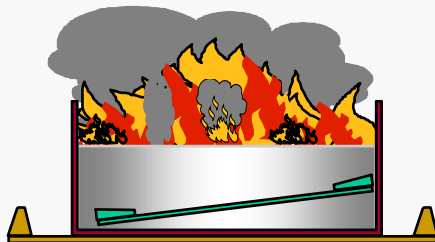
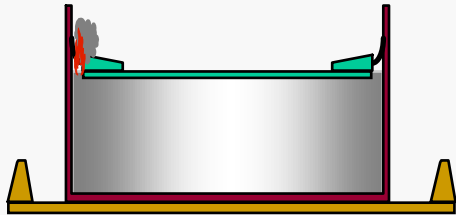
- Rigorous collection by members
- Breakdown of incident frequencies by fire type
- Expressed as frequency/tank year
- Needed for true risk understanding



Project Deliverables

- e.g. Rimseal to Full surface
- e.g. Tank to tank
- Mechanisms and probabilities

Escalation
Mechanism
Analysis

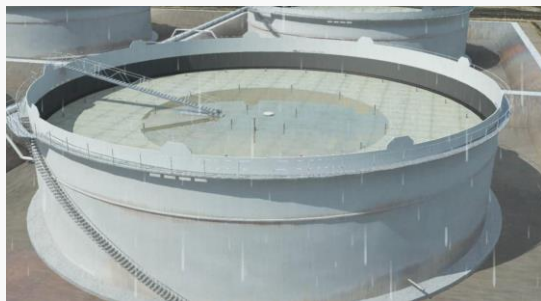


Project Deliverables

- **Prevention and Mitigation**
 - e.g. Roof monitoring
 - e.g. Detection
 - e.g. Protection systems
 - Special section on foam (many developments since!)
- **Based on operational feedback**
 - Realistic options
 - Practical advice



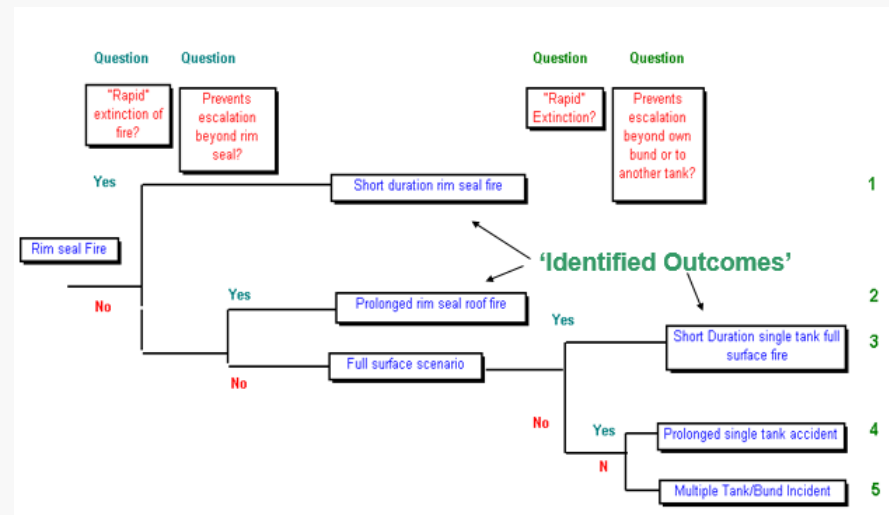
**Risk
Reduction
Options**



Project Deliverables

Risk Workbook

- Cost Benefit Analysis Data
- Allows CBA for a site specific risk reduction measure
- Event Tree Based
- Spreadsheet based version developed



Other Project Deliverables



- **Performance Test for Foam Concentrate**
 - **Aimed specifically at Tank Fires**
 - **Longer preburn**
 - **Hot metal build up**
 - **Critical application rates**
 - **Realistic Application methods**
 - **Input from responders**
 - **Used as batch acceptance test**
 - **Also test for water soluble fuels**



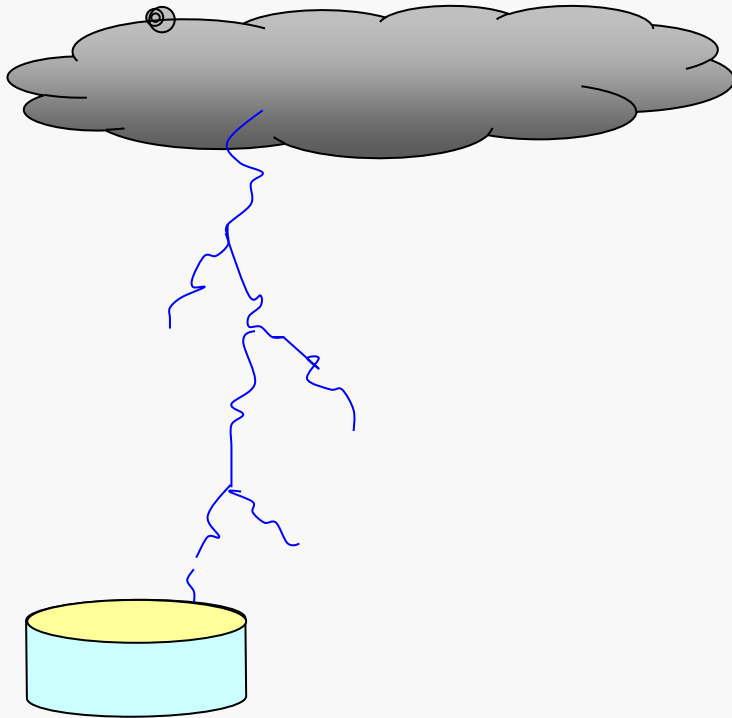
Other Project Deliverables

- Training/Workshops
- Fighting rimseal fires - DVD



Other Project Deliverables

- **Lightning Protection Study**
- **Contributed to API/EI Project**



2004 – Update Study

- Suggested by Shell
- Many developments
 - Tank construction issues
 - Detection
 - Large capacity application equipment
- New expectations & regulations
- Incident experience
- New Group formed
- Needs an Ongoing Project

Update Study Scope

- **Review of Incidents and Database**
 - **Extend to fixed roof and internal floating roof tanks**
- **Review and Update Risk Reduction Options Document**
- **Research Work**
- **Position Papers**
- **Webinars**
- **Become international industry focal point**

Update Study Scope

- Review of Incidents and Database
- Compare with previous data – trends observed

	Rim Seal Fire	Vent Fire	Pipe, Flange, Valve Fire	Bund Fire	Spill on Roof Fire
Current	3.77 x 10 ⁻⁴	1.31 x 10 ⁻⁵	1.3 x 10 ⁻⁵	1.62 x 10 ⁻⁵	6.48 x 10 ⁻⁶
Original	1.5 – 1.6 x 10 ⁻³	-	9.0 x 10 ⁻⁵	6.0 - 9.0 x 10 ⁻⁵	3.0 x 10 ⁻⁵
	Full Surface Fire	Boilover	Other	Vapour Space Explosion	Pontoon Explosion
Current	4.21 x 10 ⁻⁵	Note [1]	4.86 x 10 ⁻⁵	3.06 x 10 ⁻⁵	3.77 x 10 ⁻⁵
Original	3.0 x 10 ⁻⁵	Escalation probability 1.0	-	-	-

	Indicates a reduction in incident frequency since the Incident Survey published in 1997
	Indicates increase in incident frequency since the Incident Survey published in 1997
	Indicates new data since the Incident Survey published in 1997

Update Study Scope

- Risk Reductions Options
 - Graphics
 - Links



Figure 2.2.1 - Geodesic domes can be built on the ground and lifted into place or built directly on the existing floating roof tank and winched into place. A variety of methods are available for erection, including "jack stand" erection (top), "grip hoist assembly (bottom left) and "lower assembly (bottom right).

(a) Video Smoke Detection

This type of system uses standard CCTV equipment linked to a self-contained processing system capable of recognising small amounts of smoke within the video image, and alerting the system operator both at the processor and by a variety of remote outputs.

These systems detect smoke rapidly by looking for small areas of change within the image at the digitisation stage and only passing these pixel changes to the main processor for further filtering.

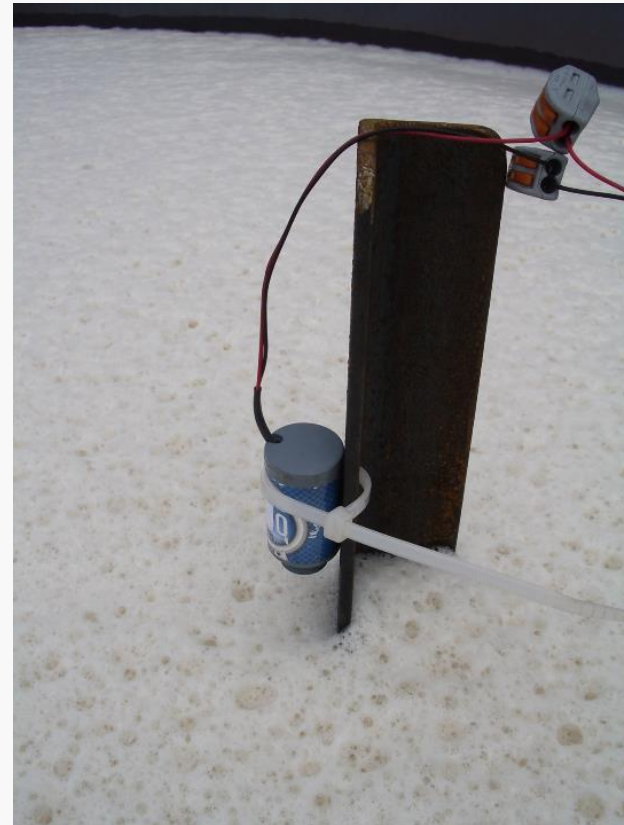
The video information is passed through a series of filters, which seek particular characteristics that can be associated with smoke behaviour.

The system installer has the ability to vary the amount of smoke signal, and the length of time that the smoke exists before an alarm condition is raised to cater for situations where there may be background smoke present. The installer can also divide the video image into zones and programme the system to alarm only if smoke is present in two or more zones.



Update Study Research

- **Typical Projects**
 - **Vapour suppression with foam**



Update Study Research

- **Typical Projects**
 - **Boilover research**
 - **Laboratory and “Field” Experiments up to ~7m diameter**



Update Study Research

- **Typical Projects**
 - **Boilover research**
 - **Laboratory and “Field” Experiments up to ~7m diameter**
- **Lessons learned published**
- **Position Paper published**

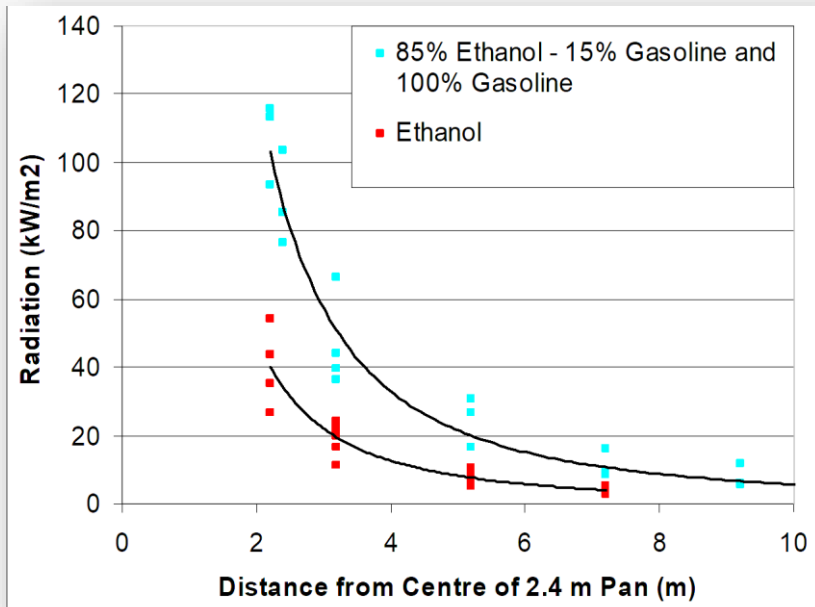
Update Study Research

- **Typical Projects**
 - **Alternative control/extinguishing techniques**



Update Study Research

- **Typical Projects**
 - **Radiant heat effects on tanks**



Update Study Research

- **Typical Projects**
 - **Seal material fire resistance**



Update Study Research

- **Typical Projects**
 - **Floating roof fire resistance**



Update Study Research

- **Typical Projects**
 - **Foam flow distance**
 - **Greater than standards suggest easily possible**



Update Study Research

- **Typical Projects**
 - **CAFs testing**



Update Study Research

- **Typical Projects**
 - **Cooling water effectiveness**



Update Study Research

- Typical Projects
 - Viscous foam issues



Update Study Research

- **Current Projects**
 - **Bund fires foam application**
 - **Application Rates**
 - **Section by section sequence?**



Update Study Research

- **Current Projects**
 - **“New Generation” Foams effectiveness**
 - **C6 and Fluorine Free**
 - **Bund and tank application**
 - **CAFs and conventional**



Update Study Research

Example:
11m Tank Test
NFPA
Application
Rates
9 Foams
4 Application
Techniques



Update Study Research

Example:
40m Test Pan
CAF Pourer
2lpm/m²
Fluorine Free
Foam
Fuel ~150mm
50% NFPA
Conventional
Aspirated Foam
Rate



Member Benefits

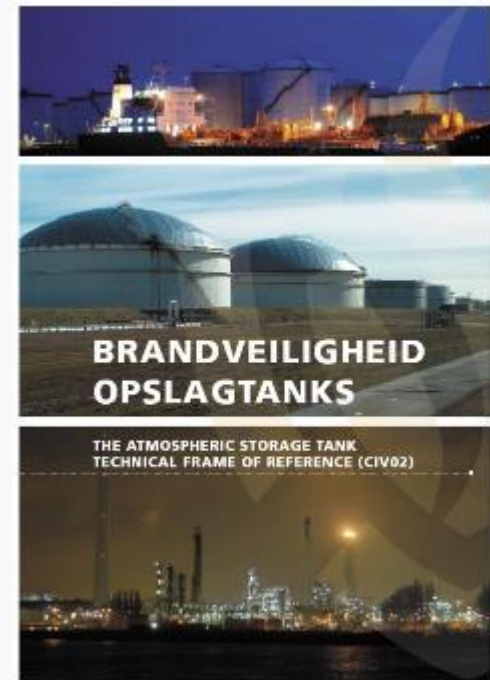
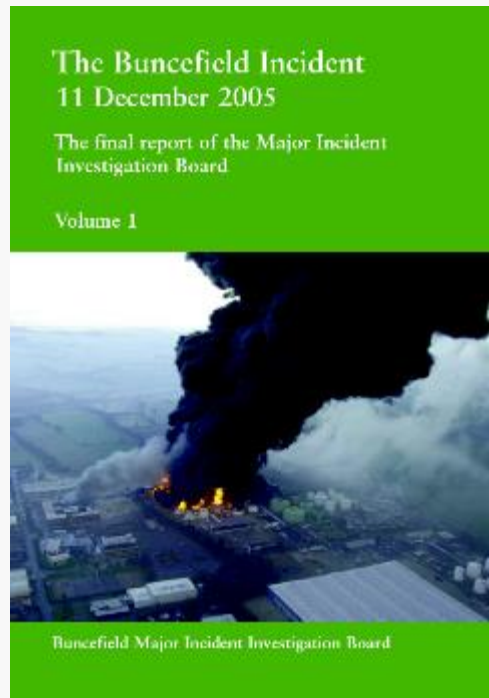
- **Direct involvement in development of latest practices, codes and standards:**
 - **LASTFIRE Risk Reduction Options**
 - **Energy Institute IP19**
 - **EI / API Lightning Study**
 - **EI Ethanol Document**

Technical input & review

Witness equipment evaluation



Industry Influence



Typical Other Deliverables

- Foam Assurance Guidance & Questionnaire
- Boilover Position Paper and Lessons Learnt
- Typical Foam Procurement Specification
- Sunken Roof Incidents Position Paper
- Linear Heat Detection Methods
- Foam Position Paper





How it Works – Membership Tiers

Tier 1 - Tank Operators. 3 x nominated STEERING PANEL Representatives and 3 votes. Tier 1 members only can be nominated for EXECUTIVE GROUP.

Tier 2 - Tank Operators, 2 x nominated STEERING PANEL Representatives and 1 vote. (Note for information: This Tier is expected to be used by tank operators with only 1-2 sites.)

Tier 3 - Organisations who are joint ventures/partners, subsidiaries or consortiums from Tier 1 or 2 member companies. 1 x member permitted at STEERING PANEL meetings, no vote.

Tier 4 - Additional individuals from Tier 1, 2 or 3 members. No vote, 1 x STEERING PANEL member (non-voting) allowed.



How it Works – Membership Tiers

Tier 5 – Associate 1 - Not for profit Response Organisations responsible for tank fire fighting or related training. Attendance at open sessions only. STEERING PANEL attendance by specific invitation only.

Tier 6 – Associate 2 - Tank Fire Hazard Management related Supplier, including commercial response and training organisations. Attendance at open sessions only. STEERING PANEL attendance by specific invitation

Contact the LASTFIRE Project Coordinator for more information on Membership Fees. Note that 2/3 of all Membership Fees directly fund LASTFIRE research, and 1/3 contributes to administration of the Project.

How it Works

- **2 meetings per year**
 - Networking opportunity
 - Invited speakers from relevant organisations
 - Experience sharing
- **Monthly newsletter**
 - Up to date LASTFIRE information
 - Relevant News & Information
- **Webinars**
- **Website Access**
 - Access to all LASTFIRE documentation
 - Access to past LASTFIRE webinar recordings
 - Incident Information



**More Information about LASTFIRE Membership
from:**

ENRG Consultants

The Old Rectory

Mill Lane

Monks Risborough, Bucks, HP27 9LG

e-mail: niall.ramsden@lastfire.org

website: www.lastfire.org.uk