

# POND

## Emerging Technology for Oil&Gas Fire Protection



# Agenda

- Safety Moment
- Introductions
- Major Fire Overview
- What the Codes really say
- What's New?
- Questions



# Safety Moment

- Where's the exit?
- What's the alarm sound like?
- Where do we muster?

# About Me



- **Benjamin E. Entrekin**
- **Registered Professional Engineer: GA, IL, TX, CA, AL, MS, NY, NJ, PA, WA, TN, NM, MD, OK**
- **NFPA Certified Fire Protection Specialist**
  
- **20 Years in oil & gas facility design**
- **10 Years exclusively in fuels fire protection**
- **7 years managing fire protection design and compliance for Kinder Morgan**

# Pond By the Numbers

**#3**

**2016 Top 25 A/E Firms**  
Atlanta Business Chronicle

**#133**

**2017 Top 500 Design Firms**  
Engineering News – Record (ENR)

**\$500M+**

**Construction Designed & engineered annually**

**500+**

**Professionals**

**21**

**National & International Offices**





# Midstream Tank Fire Overview

- Continental United States
  - 2019 Riverside, CA – 1 Tank lost
  - 2019 Deer Park, TX – 9 Tanks lost
  - 2010 Greensboro, NC – 1 Tank lost
- Outside Continental United States
  - 2005 Buncefield, UK – 20 Tanks lost
  - 2009 Bayamon, PR – 17 Tanks “significantly damaged”
  - 2009 Jaipur, India – 11 Tanks lost
  - Common Denominator – Overfill prior to ignition
- 2006 Study of 1960-2003 Incidents
  - ~26 Major (per CSB) incidents at 4,810 midstream facilities in ~40 years



# So, What Do Those Codes Say?

- **O&Ms, Engineering Standards**
  - **Owner-Determined with:**
    - EHS&S
    - Insurance
    - Legal
    - Can be risk-based or straight code adoption
- **NPFA 30 & 58, IFC**
  - Tells WHEN but always allows for negotiation with AHJ
- **NFPA 11, 13, 24, etc**
  - Tells HOW but always with room for negotiation with AHJ





# “Negotiation with AHJ”

From NFPA 30 (2018 ed)

## 1.5 Equivalency.

- Nothing in this code is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this code. Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency. The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

### 1.5.1

- The provisions of this code shall be permitted to be altered at the discretion of the authority having jurisdiction after consideration of special situations, such as topographical conditions of the site, presence or absence of protective features (e.g., barricades, walls, etc.), adequacy of building exits, the nature of the occupancy, proximity to buildings or adjoining property and the construction of such buildings, capacity and construction of proposed storage tanks and the nature of the liquids to be stored, the nature of the process, the degree to which private fire protection is provided, and the capabilities of the local fire department. Such alternate arrangements shall provide protection at least equivalent to that required by this code.

### 1.5.2

- The provisions of this code shall also be permitted to be altered at the discretion of the authority having jurisdiction in cases where other regulations, such as those for environmental protection, impose requirements that are not anticipated by this code. Such alternate arrangements shall provide protection at least equivalent to that required by this code.



# What's New in O&G Fire Protection?

- Extinguishment
  - Self-Expanding Foam Systems
    - Protect-O-Burn (Listed per UL162)
    - SFPRD PiFoam (TUV Tested per EN13565)
  - Water-Driven Foam Proportioning
    - FireDos (FM Approved)
- Detection, Alarm & Extinguishment
  - Self Contained Units
    - Fire Rover
- Exposure Protection
  - Sticky Water
    - Firelce

# Non-Traditional Approaches

- Traditional Foam (click for video link)



- 40' dia test burn
- Diesel fuel
- 1200° fire
- 1,068 gal foam sol'n
- 8:1 expansion
- 10 minute application via single chamber



# Non-Traditional Approaches

- [Self-Expanding Foam](#) (click for video link)



- 40' dia test burn
- Diesel fuel
- 1200° fire
- 300 gal premix
- 10:1 expansion
- 5 minute application via single chamber

# Non-Traditional Approaches

## Self-Expanding Foam Analysis



1 Minute Pre-burn



Knockdown at 15 Seconds



Complete Extinguishment at 25 Seconds

- 40' dia test burn
- Diesel on water
- 1200° fire
- 300 gal premix
- Used ~150gal
- 10:1 expansion
- 5 minute application via single chamber



# Non-Traditional Approaches

## ■ Foam System Comparison

### ■ Conventional System

- 8m30s Extinguishment Time
- 1/2" Foam Blanket Thickness (30 seconds after extinguishment)
- 77F post extinguishment surface temperature
- 1,068 gal solution used
- 2,500 gal minimum system for compliant installation

### ■ SEFFF System

- 28s Extinguishment Time
- 7" Foam Blanket Thickness (30 seconds after extinguishment)
- 28F post extinguishment surface temperature
- ~150 gal solution used
- 300 gal

# Non-Traditional Approaches

- [Self-Expanding Foam](#) (click for video link)

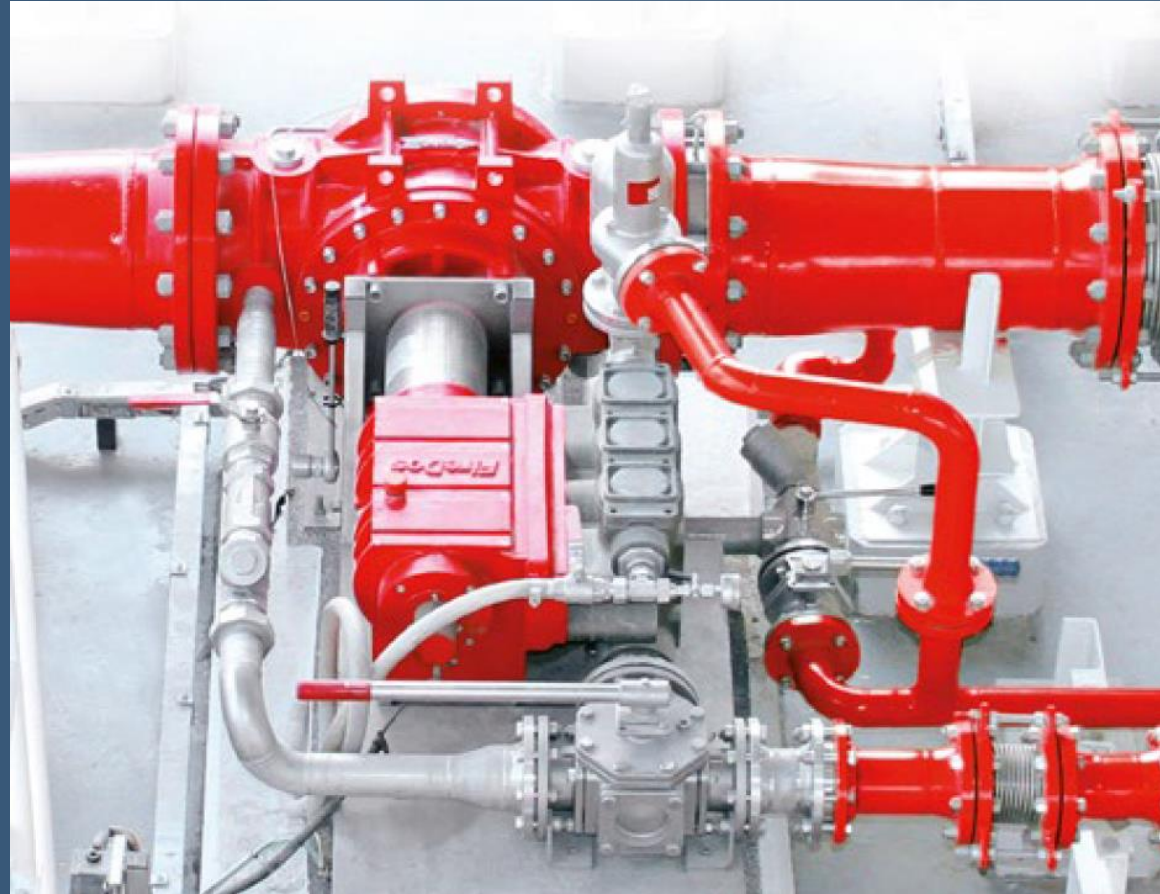


- Overhead railcar protection
- Two overhead nozzles
- Two side nozzles
- Vessel/Risers in Shipping Container



# Non-Traditional Approaches

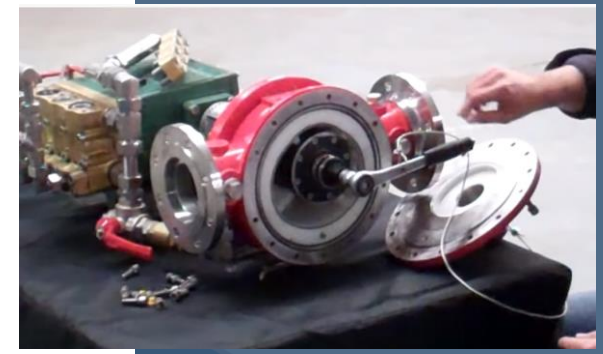
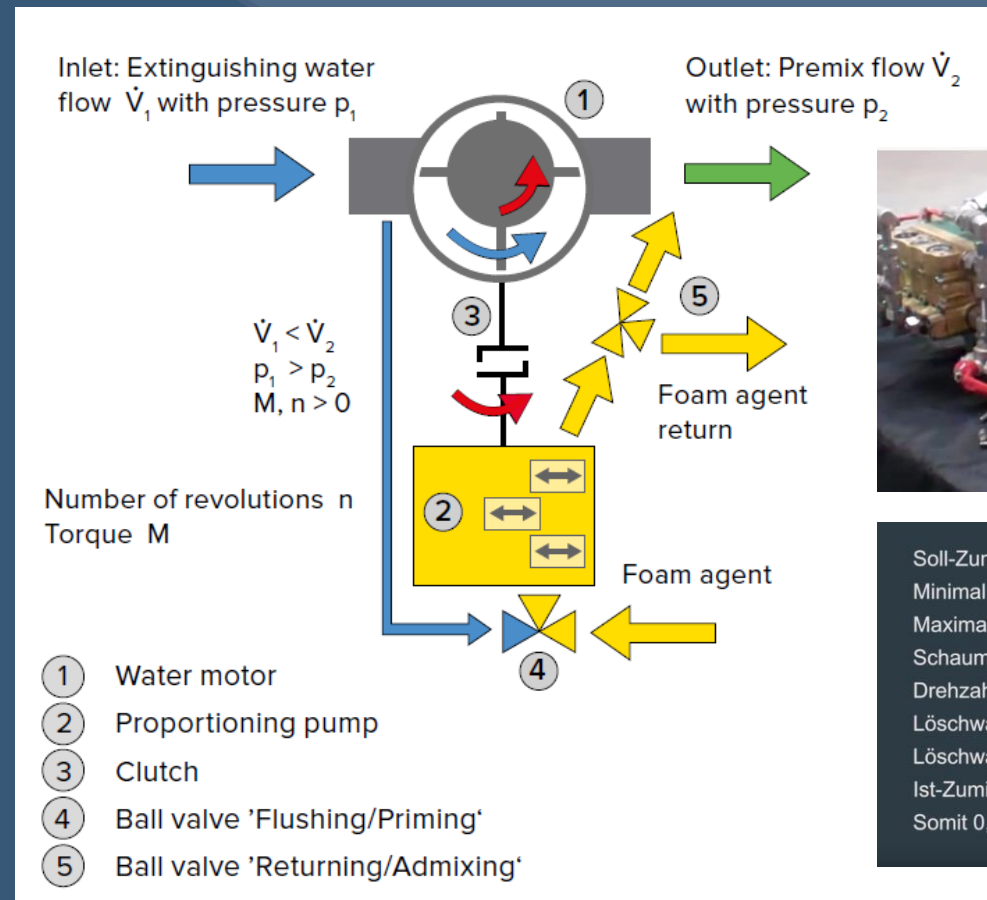
- Water-Driven Proportioning
  - FireDos
    - Uses water flow to positively proportion foam
    - Capacities from 15-5,000gpm
    - Unlimited concentrate storage / refillable
    - All-foam compatible



# Non-Traditional Approaches

## Water-Driven Proportioning

- Operation
  - PD water rotor turns common shaft
  - Shaft operates piston pump
  
- Testing
  - “Proportions” without mixing via recirc to tank



Soll-Zumischrate = 3%  
 Minimal zulässig gemäß Regelwerk = 3%  
 Maximal zulässig gemäß Regelwerk = 3,9%  
 Schaummittelstrom = 18 l/min  
 Drehzahl des **FireDos** FD10000 = 39,5 min<sup>-1</sup>  
 Löschwasservolumen pro Umdrehung = 12,5 l  
 Löschwasserstrom = 39,5 min<sup>-1</sup> x 12,5 l = 493,75 l/min  
 Ist-Zumischrate = 18 / (18 + 493,75) = 3,5%  
 Somit 0,5% Reserve!



# Non-Traditional Approaches

## ■ Foam Proportioning

### ■ Conventional System

#### ■ Bladder

- Maximum 3,000 gal concentrate
- 3,500 gpm max rate
- Cannot refill during event

#### ■ Balanced

- Unlimited concentrate
- 3,500 gpm max rate
- Requires electricity

#### ■ All Conventional Systems

- Require *actual* mixing to test proportioning
- Limited by listing to certain concentrates

### ■ FireDos System

- Unlimited Concentrate
- 5,000 gpm max rate
- No concentrate limitations
- No power requirements
- No environmental impact for testing

# Non-Traditional Approaches

- Self-Contained Detection, Alarm & Extinguishment (Click for video link)



- Standard Intermodal container
- Thermal/Video
- Pumped or pre-pressurized extinguishing agent
- Self-contained water supply
- Remotely monitored and actuated



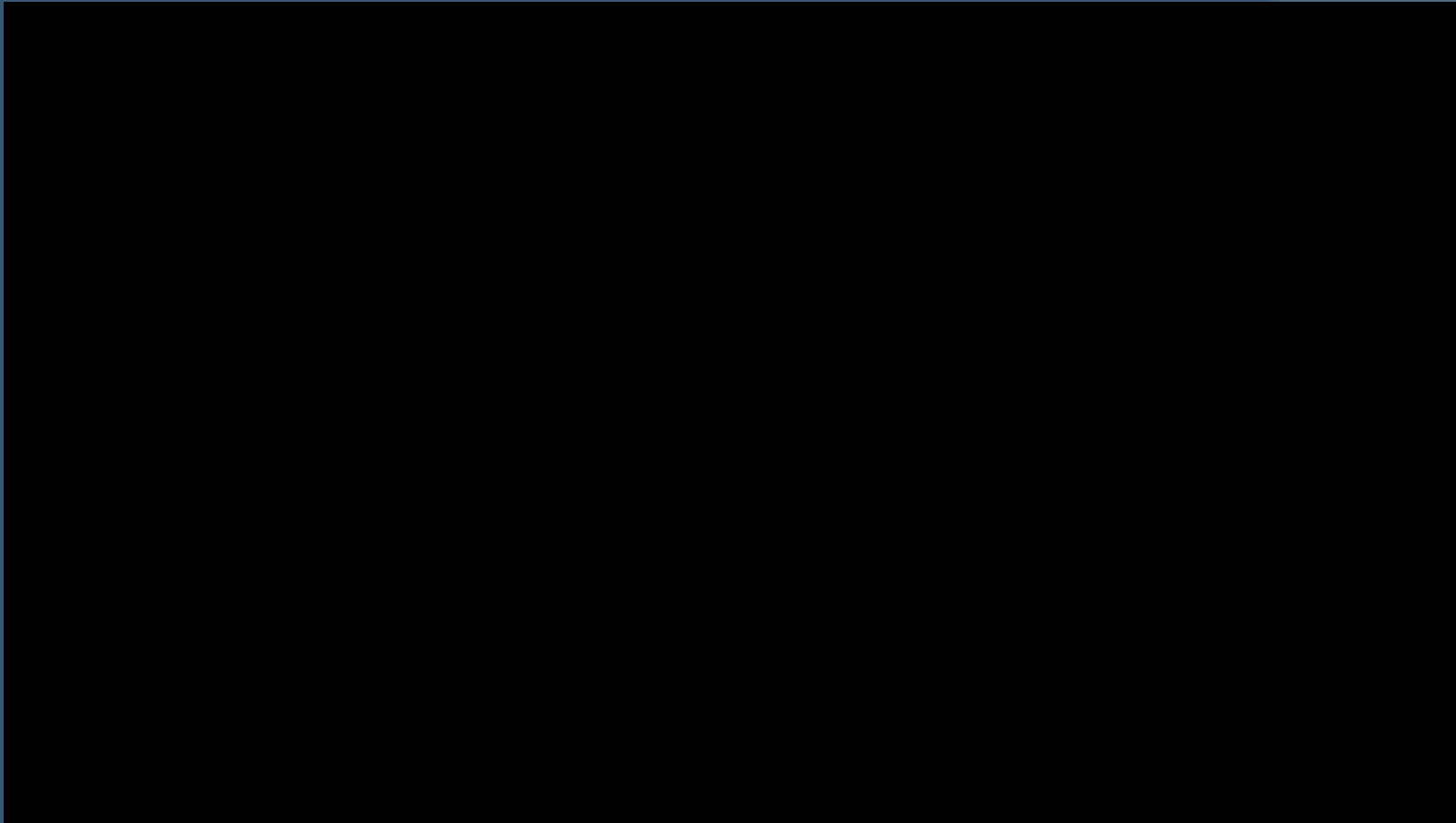
# Non-Traditional Approaches

- Exposure Protection
  - FireIce
    - Acrylate Copolymer water additive
    - Non-Corrosive
    - Non-Toxic
    - Water cleanup
  - Causes cooling water to “stick” to surface
    - Eliminates continuous cooling



# Non-Traditional Approaches

- [Fire Ice Demo](#) (Click for Video Link)



- Entire thermal capacity of water is available
- Usable as extinguishing additive also



# Non-Traditional Approaches

- [Vessel Cooling Demo \(Click for Video Link\)](#)



- Allows scheduled application of cooling water
- Personnel can exit the exposure zone
- Re-Apply as necessary instead of continuously
- Avoid flooding dikes



Questions?



# For additional information, contact:

- **Ben Entrekin, PE, CFPS**
  - **[EntrekinB@PondCo.com](mailto:EntrekinB@PondCo.com)**
  - **+1.678.336.7740 (office)**
  - **+1.404.459.2512 (direct)**
  - **+1.404.784.6914 (mobile)**

