

## API RP67 Oilfield Explosive Safety: Proposed Changes for the 4th Edition

IPS 16-01

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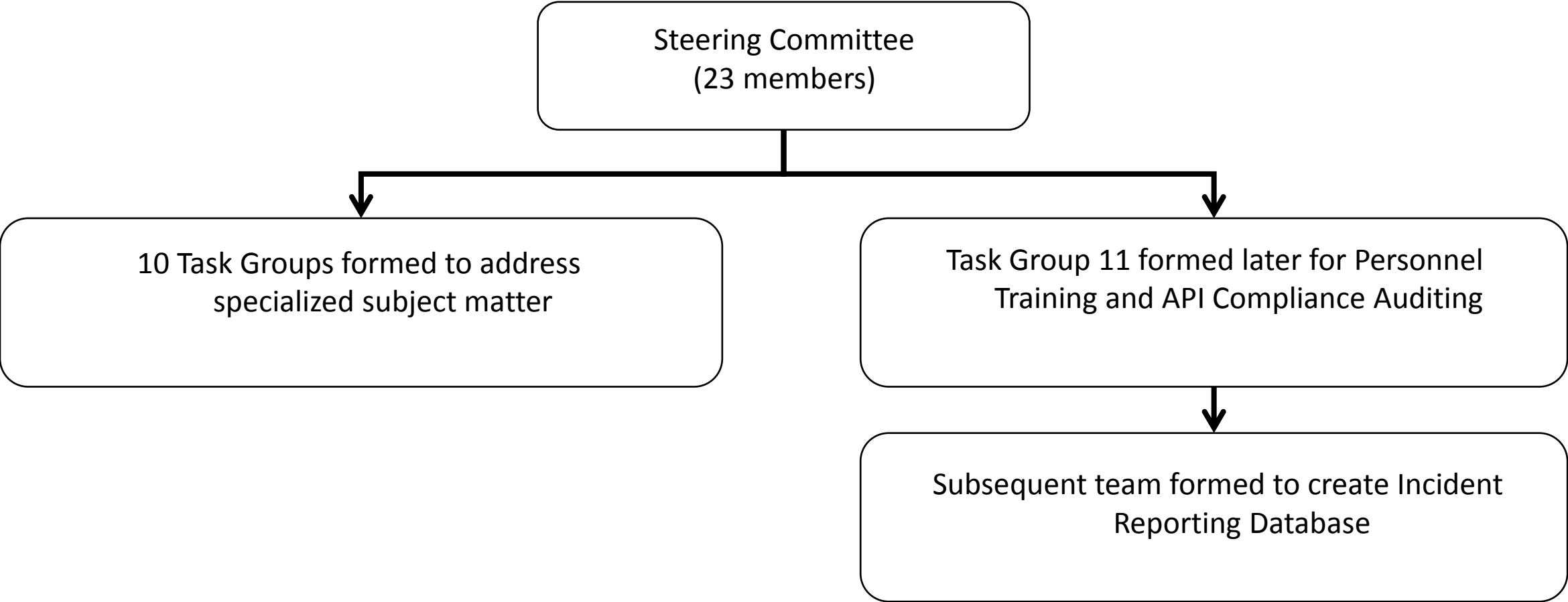
# AGENDA/INTRODUCTION

## Outline

- Genesis of the Project
- Steering Committee Make Up
- Overview of 11 Task Groups & How they Morphed
- Individual Task Groups Membership and Major Changes to the Document
- Industry Incident Database
- Questions and Answers

# API RP 67 Review & Revision

## Process / Organization



# RP 67 Steering Committee Members

- David Ayre            Co-chair            BP
- James Barker        Co-chair            Halliburton/JRC
- Kerry Daly                                    Expro Group
- Steve DeLozier                                Casedhole Solutions
- Jim Ellis                                        Ecosse
- Al Salsman / Oliver Han / Alfredo Fayard   Schlumberger
- Parul Kapur / Andrea Boock                Shell
- Jim Gilliat                                     Baker Hughes
- Hanaey Ibrahim                                PDO
- Andy Pettitt                                    SPEX
- Dan Pratt                                      Owen Oil Tools
- Frank Preiss                                    DYNAenergetics
- John Segura                                    Weatherford
- Alphie Wright                                 Hunting-Titan
- Larry Albert                                    Allied-Horizontal Wireline Services
- Phil Crabtree                                 Chevron
- Tony Ryan                                     ConocoPhillips
- Bob Ference                                    Consultant
- Alex Linville                                    Pacific Scientific
- Caitlin Bowers                                Continental Alloys
- Iain Maxted                                     Guardian Global

# API RP 67 Task Groups

1. Detonators, Delays,  
Surface Firing Panels,  
WL Interrupts

2. Interrupts – now tasked  
with Time Delays

3. Downhole Tractors

4. Temperature Management

5. Firing Heads on  
Bottom of Guns,  
Slickline Firing Heads

6. Coil Tubing Conveyance

7. Security / Regulatory

8. Pipe Recovery

9. Surface Pressure  
Control Equipment

10. Special Categories of  
Explosive Devices

11. Personnel ,Training , and  
RP67 Compliance Audits.

# Most recent activity

- Update to the AESC, and API 19B SC in Oct 2015. Industry comments received from the AESC audience.
- Multiple SC Meetings, the Draft RP67 document now created incorporates proposed changes from all 11 Task Groups that have submitted material.
- Draft RP67 document submitted to API, April 2016

# Task Group 1

## Detonators & Delays, Firing Panels, WL Interrupts

- Group Members:
  - John Brzuzy – BHI
  - Jim Brooks – PRJ Consulting
  - Matthew Clay – Owen
  - Steve DeLozier – CasedHole Solutions
  - Bob Ference – <sup>c</sup> Consultant
  - John Jordan – HuntingTitan
  - Philip Kneisl – Petro-Explo
  - Jim Hill – HAL/JRC
  - John Mason – BP
  - Andy Pettitt – SPEX
  - Ben Potter – Owen
  - Frank Preiss – DYNAenergetics

# Task Group 1: New/updated Content

Detonators & Delays, Firing Panels, WL Interrupts

- Detonator classifications
  - Group 1
    - Primary explosives allowed
    - 50 ohm
    - No fire 200 mA
    - RF: follow IME SLP-20
  - Group 2
    - Primary explosives allowed
    - No fire 25 volts
    - RF: manufacturer-defined per IME SLP-20 tables with calculated example(s)
    - FMEA by ITPO



# Task Group 1: New/updated Content

Detonators & Delays, Firing Panels, WL Interrupts

- Detonator classifications cont.
  - Group 3
    - No primary explosives allowed
    - No fire 120 volts
    - RF safe
    - FMEA by ITPO
- Selective Gun Systems
- Gun Loading Shop Requirements
- Independent Third Party Organization (ITPO)
- Lightning update for section 8 – Electric Line Conveyed Operations

# Task Group 2 New/updated Content

## Time Delays (Pyrotechnic and Electronic)

### ■ Group members

Frank Preiss	DynaEnergetics, to commission team
Gary Sutherland	DynaEnergetics
Bob Ference	Schlumberger
James Barker	Halliburton/JRC
Kerry Daly	Expro
Manufacturers x 4	Fike/PacSci/Nammo Buck / ATK

### ■ Subject matter includes:

- Time Delay Description
- Design Features and Characteristics (pyrotechnic and electronic)
- Assembly Installation
- Gun Shop Preparation and Installation/Arming Procedure (if applicable)
- Wellsite Operational Concerns and Preparation and Installation/Arming Procedure

# Task Group 3

## Tractors

- Group members:
  - Brian Schwanitz - Welltec (chair)
  - Andrew Massie – BP
  - John McGrath - Guardian
  - Homero Castillo - Baker Hughes
  - Thilo Scharf - DynaEnergetics
  - Gerald McInally – Aker
  - Guy Mason - GE

# Task Group 3

## Tractors

- Key Items

- Two safety barriers required between the tractor electrical circuitry and the explosive components
- Multipoint failure analysis on tractor system and two barriers to be conducted by an Independent third party organization (ITPO)
- No single-point failure will cause or permit voltage to be applied to explosives

# Task Group 4

## Thermal Management

### ■ Members

- **David Ayre**, *BP*
- **Bob Ference**, *Consultant*
- **Andy Pettitt**, *SPEX*
- **Justin Mason**, *JRC/HAL*
- **Shaun Geerts**, *Owen Oil Tools*
- **Chris Sokolove**, *Hunting Titan*
- **John Hardesty**, *GEODynamics*
- **David Huber/ WB Harvey**, *Baker Hughes*
- **Ed Cannon / D. Betancourt**, *Baker Hughes*
- **Hanaey Ibrahim** , *PDO/Shell*
- **Achim Pabst / Roland Peters**, *DYNAenergetics*
- **Ed LeBlanc**, *Cased Hole Well Services*
- **Andrea Boock**, *Shell*
- **Steve Henderson** *Schlumberger*

# Task Group 4

## Thermal Management

- 2 Major Changes

- A) Description / Suggested Actions in a Thermal Runaway event

- Partial low order detonation, exponential increase in internal temperature & pressure
    - Typically shallow well environments ~ 30mins from TD to guns at surface
    - Following Actual / Known events
    - Standard “wait times” – Safety Mtg / MoC,
    - 30mins to “200ft” level
    - Flow Chart
    - Above 212F quarantine guns for 2 hrs
    - IR Thermometer Temp1 time1 vs Temp2 time2

# Task Group 4

## Thermal Management

- B) HMX Testing
  - HMX subjected to temperatures above 300-330F under goes a phase change from the beta to delta crystalline structure, which is a more shock sensitive structure.
  - Phase change is irreversible.
  - 2005 PSF More testing is needed
  - 2012 N. Sea issue. Is HMX that has transitioned still legal to be transported per UN / DOT?
- The Plan
  - UN Test Series 4b(ii) 12 m drop test. Go-NoGo test for approval to transport packaged items. Charges in boxes
  - Prior Work: Canadian Industry drop tested mostly RDX guns, some HMX. No heat sensitized explosives

# Task Group 4

## Thermal Management cont.

- Do we have a problem? How serious is the problem?
- Two Part Solution: 1) Box tests first followed by 2) some form of loaded gun drop tests or analog tests.
  - Got quotes for testing from UN / DOT approved test site, and solicit funding from API, ~\$112k approved. Safety Consulting Engineering (SCE) selected Contract from API issued and accepted.
  - Industry agrees to participate. 5 Manufacturers tested 10 products
- Test
  - Drop 3 boxes per product, total of 30 drops.
  - Heat soaked charges at 330F (165C) for 4 hours, then forced cooled to ambient.
- Results: All boxes passed



# Task Group 4

## Thermal Management - cont

- Intermediate Steps
  - Reversibility / Irreversibility Tests on oilfield HMX powders
  - Conducted at UTEC Corp. Riverton, Kansas
  - Validated prior DYNAenergetics work. – IREVERSIBLE
- Prepared summary for inclusion in API RP 67
- Data we have may be sufficient to approach DOT for an industry wide exemption without the need for gun drop tests. Proposed to approach DOT via the IME.

# Task Group 5

## Firing Heads on the Bottom of Guns / Slickline Firing Heads

### Group members – TCP Heads

Joe Henke – Hunting Titan

Justin Mason – HAL

Parry Hillis – BakerHughes

Mohammed Medhi – SLB

Kent Folsie – Shell

Doyle Dean - BP

- Complete. No changes from 2<sup>nd</sup> edition.
- Key points from existing document are:
  - Demonstrated safe design
  - Prior review and agreement by service company and operator

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- Group members – Slickline Firing Heads

– Kerry Daly – Expro

– Kevin Anderson- MicroSmart

– John Creighton- Paradigm Geokey

– Paul Church- Probe

– Scott Griswold- Schlumberger

– Jaime Miller- Spartek

– Malcolm Thom- Spartek

- Added Slickline Firing Heads
  1. Mechanical/pressure type
  2. Battery operated memory systems
  3. Surface-controlled type (digital/acoustic)
  - 30-ft drop test requirement
  - For mechanical/pressure heads: Two independent safety features to prevent inadvertent functioning

# Task Group 5

## Slickline Firing Heads

- For memory-type or surface-controlled
- Firing windows defined
- Two independent safety features to prevent inadvertent functioning
- FMEA by ITPO
- Retrieval considerations for disarming

# Task Group 6

## Coil Tubing Jobs

- Group members

- Mark Brinsden - Shell
- Roger Frost – BP
- Kerry Daly – Expro, Chair
- Parry Hillis – Baker Hughes
- Justin Mason – HAL
- Kevin George – Geodynamics
- Bryan Chubala – Brico Oil Tools
- Mohammed Medhi – SLB
- Kent Folse – Shell

- Risks of multiple services recognized: Pumping, CT, Perforating
- Job agreement between service company and operator, CWOP and/or SIT
- Trip/pop-off valves: Set in accordance to equipment ratings and job parameters
- For absolute and differential pressure firing heads: Communication ports and weep holes are to be used to prevent firing due to trapped pressure
- No pressure testing of pressure-activated firing heads with loaded guns attached
- During deployment: Monitor pressure on CT and wellhead to ensure equalization occurring and no excessive pressures are applied to the firing head system
- Descent rate agreed between service company and operator
- For differential firing heads: Best practice to never drop a second ball, but provision included to allow if no other alternatives are available and agreement between service company and operator
- For misfire recovery operations, best practice considerations are given
  - Trip/Pop-off valve
  - Leaving guns in hole
  - Pressure bleed down between lubricator and CT

# Task Group 7

## Security / Regulatory / Transportation

- Group members
  - **Richard Arsenault**, *Casedhole Solutions*
  - **James Barker**, *JRC*
  - **Rick Borgus**, *Wildcat Wireline*
  - **Shelley Espinoza**, *Hunting Titan*
  - **David Huber**, *Baker Hughes*
  - **Kenny Jordan**, *AESC*
  - **Ed LeBlanc**, *Cased Hole Well Services*
  - **Randy Nance**, *Armag Corp.*
  - **Andy Pettitt**, *SPEX*
  - **Dan Pratt**, *Owen Oil Tools*
  - **Bob Ptak**, *Express Energy Services*
  - **Eric Rosemann**, *Gray Wireline*
  - **Thilo Scharf**, *DYNAenergetics*
  - **Troy Walker**, *Walker Technologies*
- Security language strengthened
- Expanded language for international requirements
- Role of Responsible Party
- Storage
  - Packaged Explosives Storage
  - Loaded Perforating Gun Storage
  - Key Control / Recordkeeping
- Transportation
  - Transportation Controls / HAZMAT Employees
  - Route planning
  - Communication
  - Breakdowns and Incidents
  - Safety Permits - Government
  - Common Carrier Evaluation
  - Return of Excess Explosive Material
- Disposal / Recycling of Spent Perforating Guns

# Task Group 8

## Pipe Recovery

- Group members
  - JW Segura – WFT
  - Barry Chapman – SPEX
  - Kevin Morton – JRC
  - George Brunner – Baker
  - Tony Grattan – MCR
- No changes

# Task Group 9

## Surface Pressure Control Equipment

- Group members
  - **Keith Henderson** – *Hunting Titan (Co Chairman)*
  - **Jim Aubrey** – *Hunting PCE (Co Chairman)*
  - **Richard Housden** – *Halliburton*
  - **Mark Robson** – *Oil States Energy Services*
  - **Kevin Airth** – *NOV Elmar*
  - **Kenneth Filipchuk**- *Weatherford*
  - **Bob Ference** – *Schlumberger (consultant)*
  - **Andrew Massie** - *BP UK*
  - **Steve Delozier** – *Cased Hole Solutions*
  - **Oliver Han** – *Schlumberger (Replaced Bob Ference)*
- Wellsite pressure testing of surface pressure control equipment should be completed prior to inserting any explosive device into the surface pressure control equipment string
  - Lubricator string not to be tested above its max working pressure
  - Recommend use of Quick Test Safety Sub or Wireline Safety Valve
  - If the surface pressure control equipment must be tested with an explosive device inside, special precautions shall be taken.
  - Non-volatile liquid, typically a 50 / 50 mix of glycol and water
  - Low volume / high pressure pump equipped with over-pressure protection
  - Test pressure shall not exceed 80% of the pressure rating of the explosive device
  - Exception does not apply to exposed charge guns or cutters. These devices shall never be exposed to a pressure test.
  - Warning about adiabatic heating with high volume, high pressure pumps.
  - Vent sub use is encouraged
  - Well pressure equalization steps are given
  - 75-ft safety zone recommended if wellsite allows

# Task Group 10

## Special Categories of Explosive Devices (propellants, setting tools, core guns)

- Group members
  - Kerry Daly – Expro
  - Dan Pratt – Owen Oil Tool
  - Jim Gilliat – BHI
  - David Cuthill – Geodynamics
  - Tony Grattan - MCR Oil Tools
  - Joe Haney - StimGun
  - Dr. Richard - Schmidt- GasGun
- Key additions:
  - Section for propellant stimulation tools
  - Added Field Safety Considerations



# Task Group 11

## Personnel Training, Critical Safety Equipment and RP67 Compliance Audits

- Group members
  - Craig Beveridge - Owen Oil Tools
  - Rory DeHart, JRC
  - Kenny Jordan, AESC;
  - Bart Pena
  - Ravi Raura, Allied Horizontal;
  - James Cole, Khaled Gasmi, BHI;
  - Leonard Reed
- Expanded list of definitions and acronyms
- Personnel Training
  - Rationalized EUIC requirements / HAZMAT Employee
- Added Critical Safety Equipment
- Added subsection for “*Recommended Equipment*”
- RP67 Compliance Audits
  - Existing company processes referenced
  - Defined verbiage - Service companies self-audit and provide documentation as requested to Operators on compliance
- Addendums
  - Stray voltage worksheet created
  - Explosive Arming and Disarming Safety Critical Fundamentals
  - Explosive User in Charge well site checklists

# Incident Database Group

## Incident Database

- Group members
  - Frank Preiss – DYNAenergetics
  - JW Segura - Weatherford
  - John McGrath - Guardian
  - Parul Kapur – Shell
  - Kenny Jordan – AESC
  - Jim Gilliat – BHI
  - John Davidson – Chevron
  - Matt Bell – GEODynamics
  - Chip Levine – Hunting -Titan
- Implementing a database to track industry incidents (similar to SAFEX reports)
- Located on Perforators.org website
- Active for 1 year now

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# 2016 INTERNATIONAL PERFORATING SYMPOSIUM GALVESTON

QUESTIONS? THANK YOU!

IPS 16-01

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