

*API RP67 Oilfield Explosive Safety _ Proposed Changes
for the 4th Edition*

SLAP-16-02

DATE

PRESENTER: Mark Brinsden, Shell

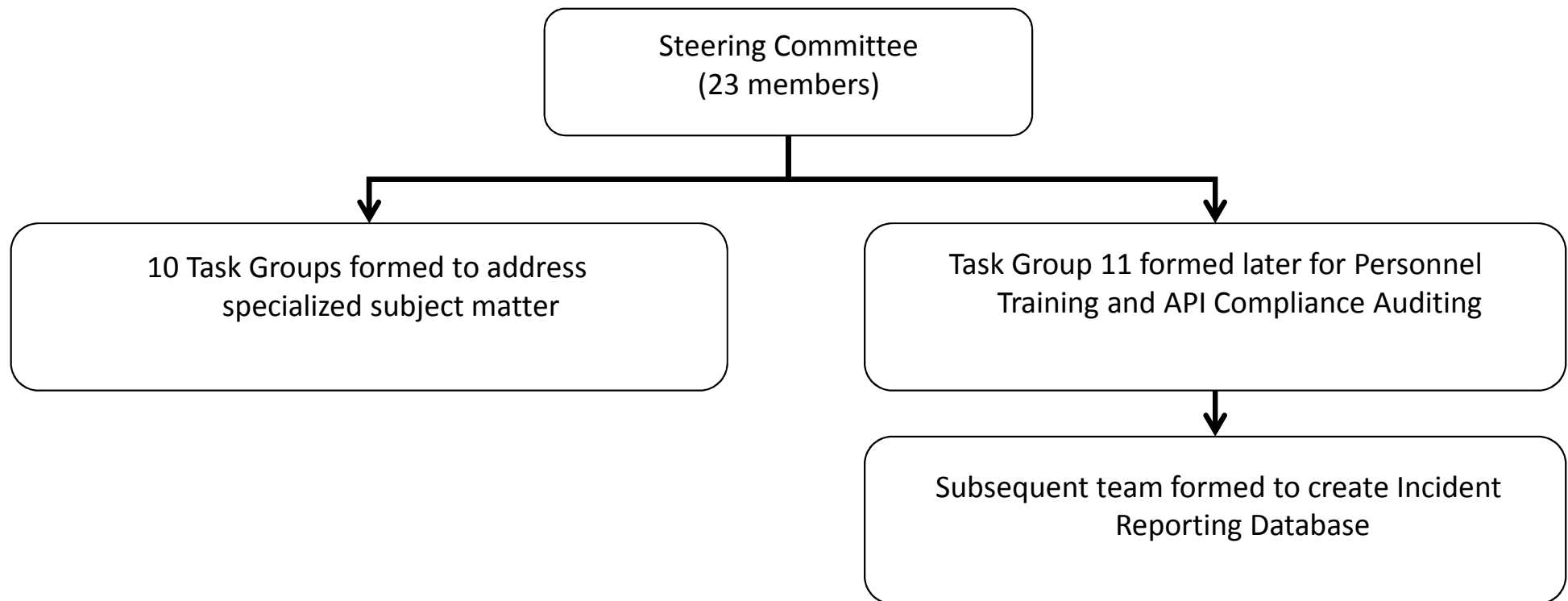
AGENDA/INTRODUCTION

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
- Alphonse 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 – ^c 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 Folse – Shell

Doyle Dean - BP

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

• Group members – Slickline Firing Heads

– Kerry Daly – Expro

– Kevin Anderson- MicroSmart

– John Creighton- Paradigm Geockey

– 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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QUESTIONS?
THANK YOU!

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