

---

*The use of propellants in the oilfield has a very long and colorful history. Many tragic mistakes have been made, however many great success stories also abound. With that in mind, below are a few Incidents where better planning and execution would have told a very different story if simple rules and procedures were adhered to.*

---

## Incident 1.

### **Running TCP using 3 1/8 guns and StimGun sleeve**

*The Job. Make up BHA and perforate 10297 – 10300, 10330 – 10338 and 10342 – 10356ft. Run in with packer, circulate and then set at 10190ft. Fire guns with Auto-Vent pressure firing head.*

The job procedure, written and prepared by a regional manager, said it stated that he intended to use oversize rings for the StimGun sleeves. However, the field person who did the work at the Wellsite apparently did not use them. Their regular practice was to measure the outer diameter of the StimGun assembly to insure that the right equipment was being used (i.e., oversized rings) but in this the field person did not. The field person stated that he used whatever rings were in inventory there, and that those were the undersized rings (these were some of the original circular rings). He stated when working for another company, he always used oversized rings and knew that the purpose of the oversized rings was to protect the propellant sleeve. He said that he used undersized rings on every job at current company, with no problems, after the rings supplied by his old company he worked for “ran out”. He said that those were the “only” rings that were in the inventory. The Regional Manager stated he always called for the use of oversized rings, and the people who worked for him knew that. In fact, he said, the company even had a local machine shop that made oversized rings to the company’s specifications, which (rings) were to be in inventory.

The field person admitted that he did not measure the outer diameter of the assembly on-site, but that it did not matter because he intended to use the undersized rings anyway. The manager’s email stated that they intended to use oversized rings. This confirmed that the company was well aware that oversized rings would help protect the sleeve and that they “should be used” in most - if not all - circumstances. Further, the company never consulted with Owen about the TCP job. In addition, the company has/had no evidence to indicate that the cause of the incident was the rings or any defect in the sleeve or gun. They seemed to be guessing at the cause of the incident (saying perhaps “something was dropped or kicked in the hole”, although there was no evidence of that happening).

## Result, job report.

On location and make up equipment on ground.  
Safety meeting and RIH with guns after testing tubing joint and packer to 8,000 psi.  
RIH with 1,000' of tubing to circulate acid pill.  
Continue to RIH with tubing while testing  
While RIH going down with tubing something hung up @7500 as if packer set, hole will take fluid with open perforations.  
Try to release packer with no success, work pipe up and down a few times and try to release packer.  
Still no success, hole will take fluid with open perms, fluid level estimated around 3,700'  
Load casing, and put 500 psi on it and held as if packer was set with 259 joints in hole  
Got off/on/off tool, circulate acid out 150 bbls and got back on to try to release packer before POOH  
Got back on packer and released packer, pull 4 stands

Continue POOH with guns  
At surface with packer and bottom of J-slot damaged with slips up on setting cone of packer.  
The bottom of the J-slot was flared out, the 2 3/8" P-110 sub below packer was also crushed  
POOH with guns and saw that the stim sleeve and guns were all fired.

Run casing logs to verify perms with casing inspection tool and to see if casing was damaged.  
Logging verified bottom perf @ 7679' and casing not damaged

## Conclusion.

The StimGun sleeve was ignited due to the friction caused by the sleeve material rubbing on the casing while RIH. The root cause were the undersized retaining rings (OD of ring was less than the OD of the sleeve) being used to protect the sleeve and secondly no finned subs were run through the gun BHA.

## Incident 2.

### Running TCP/DST using 2 3/4 guns and StimGun sleeve

The Job. Make up BHA with DST and perforate

The job proceeded as planned, but the rig was having several problems cycling the DST tubing-orienting valve operating correctly, after packer was set. However, after approximately 120 hours in the hole (at 360 Deg F), the tubing “jumped” in the slips on the table, no attempt was made to fire the guns. It was finally determined that an explosive event had occurred downhole, but there was no communication to the formation, as the casing below packer was holding pressure. The decision was made to abort the test pull the BHA out of the hole. When the pipe was picked up, it was noted the packer had been unseated. At surface, the 2 3/8 P110 pup joint below the packer had been crushed and the gun Auto-release sub had been activated, leaving the guns in the hole. It was not initially thought that the sleeve had ignited, however Owen did not have any temperature test data, especially in the fluid that the company was using (Novatek Saraline 200), therefore a temperature test was initiated at the Owen Godley facility.

DATE	TIME	CONTROL TEMP. DEGREES (F)	REFERENCE TEMP. DEGREES (F)	PRESSURE	HOURS
10/23/2006	2:30 PM	30	75	2,000	
*Start Test*	4:45 PM	416	400	10,000	0 Hours
12/24/2006	12:15 AM	415	399	10,000	
	4:45 PM	412	399	10,000	24 Hours
12/25/2006	12:15 AM	414	399	10,000	
	4:45 PM	417	401	10,000	48 Hours
12/26/2006	12:15 AM	418	400	10,000	
	4:45 PM	408	400	10,000	72 Hours
*End Test*	7:45 PM	414	399	10,000	75 Hours
Averages (@ temp. & press.)		414	400	10,000	



The test piece of Stim sleeve before and after test.

(Full test report has 164 data point records)

### Conclusion.

The guns were fished, however only the first gun was recovered. The bottom of the gun had sheared off at the threads, the detonating cord and boosters in recovered gun appeared to have been burned (all HNS explosives). The root cause was a low order detonation in the gun system, it was determined that the O Ring material had reacted with the wellbore fluid, and combined with the wellbore temperature, had leaked causing the guns to low order detonate through adiabatic compression. Although no perforations were made in the casing (high order detonation required), holes were made in the guns (low order detonation) which was more than sufficient energy to initiate the StimGun sleeve material.

## Incident 3.

### **Running wireline using 3 3/8 guns and StimGun sleeve**

*The Job. Make up wireline guns, RIH and perforate tight permeable zone*

The job plan was to order guns, charges and StimGun sleeves from OEM manufacturer. The customer planned to make all the retaining rings, finned top subs, tandem subs and bull plugs locally. Unfortunately, when RIH the StimGun sleeve ignited at about 600 meters. The guns were pulled out of the hole where it was verified it had fired.

*Conclusion.*

When manufacturing the retaining rings and finned subs, the maximum diameter given to machine shop that the subs were to be made too, was actually the same size as the sleeve OD. The number of fins welded to the subs were also insufficient as compared to OEM recommendation. The root cause was human error, and equipment not fit for purpose.

## Incident 4.

**There is no report available for this incident, however.**

A thru tubing job was planned to run Stimtube, the initial plan was to run the 1 11/16 OD tube and the operator had all the hardware to run this service including; top sub, tandem collars and bull plug – all 1 11/16” OD. For a reason not understood, the operator change his mind and ordered 2” OD stim tubes.

Unfortunately he thought he could utilize the same hardware (which does use the same connection size threads), made up the tool assembly and proceeded to RIH.

*Result and Conclusion.*

The material friction ignited when RIH, the operator had chosen not to purchase the correct running equipment (all subs and collars for standard size or oversized) and literally “paid the price”.

## Incident 5.

### **Running wireline using 3 3/8 guns and StimGun sleeve**

*The Job. Make up wireline guns, RIH and perforate tight permeable zone*

The job was planned, where guns, finned subs and charges were supplied by another supplier. Only the StimGun sleeves were supplied by Owen. The customer loaded two guns both with 6 foot of Stim sleeves (two each time 3 foot); however did NOT use a retaining ring between the sleeves. Unfortunately, when RIH the StimGun sleeve ignited in the upper section of the hole that did not have fluid in it. The guns were pulled out of the hole where it was verified it had fired.

*Conclusion.*

It is believed that the friction caused by the 2 sleeves being in intimate contact with each other and being allowed to move caused enough friction to ignite the material.