



BAUERBERG KLEIN
TRAINING & CONSULTING





Module 4

PERFORATING OPERATIONS

CONTENT

- *Steps in the design and execution of perforating operations*
- *Design phase*
- *Gun preparation*
- *Deployment of the BHA*
- *Gun activation*

STEPS IN THE DESIGN AND EXECUTION OF PERFORATING OPERATIONS

JOB PREPARATION

Equipment testing, QA/QC and verification of original design, planning & contingency

GUN DEPLOYMENT

Equipment set up at the well site, safety checks, well handover and lowering the gun system to firing depth

DESIGN STAGE

Development of the technical and operational specifications

PERFORATING PROCESS

EVALUATION

Initial well flow, well test and skin determination

ACTIVATION

Gun positioning, change in operational conditions and actual firing of the guns at reservoir level

DESIGN STAGE

It includes all the technical aspects related to perforating such as gun and charge and method selection as well as operational planning and Quality Control.

1. Review of reservoir properties and well characteristics
2. Type of charges and its characteristics(weight, temperature ratings...)
3. Deployment method, preliminary operational procedures, well conditions and description of the equipment to be used
4. Predicted results, perforation's length, Inflow and productivity estimations (including potential damage/skin)

The resulting design program will then be used as a working document that will allow initial input from other areas/department involved/contributing.

JOB PREPARATION

RESPONSIBLE	TASK	REMARKS
OPERATOR	Service supplier selection	Service company QA/QC review
	Inspection and testing	Visual inspection of yard/shop testing
	Rig and site evaluation	QA/QC review for perforating operations
	Accessories and support equipment selection	Pumping, tanks, WT and nitrogen equipment as required
	Logistical and administrative	Contracts, rig's mob/demob, operational planning and well site preparation
RESPONSIBLE	TASK	REMARKS
CONTRACTOR	Verification of equipment availability	Well control, gun system, charges and control unit available and in working order
	Certification and permits	Charge certs, pressure test charts and records of all equipment to be used
	Site inspection prior to operation	Visual inspection of well site in order to plan equipment layout, safety working requirements
	Safety and Planning	To be carried out with the customer and other contractors, HAZOPS
	Logistical arrangements	Order third party components and equipment, timings and personnel selection

GUN PREPARATION

- Transportation from base to location
- System preparation and assembly on site
- Operational interaction and integration with current site operations
- Breaking and restoring well integrity to insert system into the well
- Lowering the gun to depth



GUN DEPLOYMENT

- Process depends on method selected (TCP, WL, CT..)
- Pressure control requirements
- Rigless for CT/WL

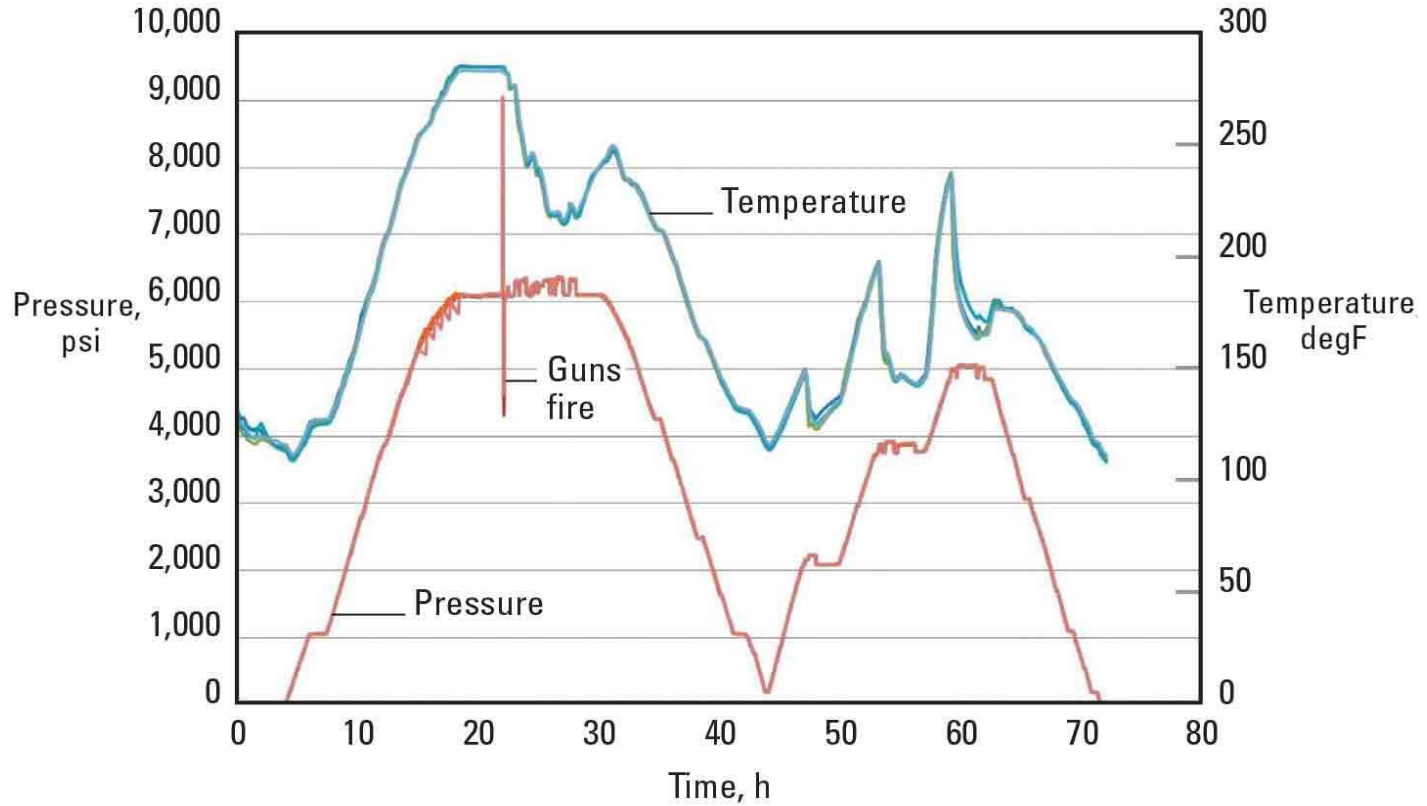


(Courtesy of Innicor)

GUN ACTIVATION

- Confirmation of mechanical status of the gun and accessories downhole
- Positive confirmation of gun's positioning and orientation
- Activation and confirmation of firing
- Gun and accessories retrieval or disposal
- Positive indication establishing inflow from the reservoir via production information flow/pressure/temperature

GUN ACTIVATION (Continued)



JOB EVALUATION

LOCATION	WHAT TO EVALUATE	HOW
Well site	Confirmation of gun location via CCL(Sonic) or GR(Radioactive)	Using pup joint placed on casing/liner
		Using radioactive marker positioned in the casing
	Confirmation of firing on control unit screen	Being present during actual firing operation
	Identification of positive reservoir-wellbore communication being established immediately after firing	THP or surface pressure increase, flow of well fluids after activation
	Visual inspection of gun after retrieved from well	Counting each and all of the charges to ensure that were fired
Off site	Quantification of flow/pressure contribution throughout the reservoir	Running production logging tools PLTs
	Inspecting for any particular problems encountered	Visual inspection of system redress and servicing at the shop
	Well productivity and performance	Carry out NODAL analysis to determine actual well performance
	Operational performance	Review detailed reports to identify areas for further improvements
	Determination of detailed gun performance	Using analytical models to determine shot penetration and flow

MODULE 4 – SUMMARY

Perforating includes at least four (4) steps: design and preparation, gun preparation, gun deployment and activation, job evaluation

The operator participates in the selection and specification of the gun system and the contractor on the detailed preparation, assembly, deployment/retrieval and activation of the system

QA/QC, testing and verification is perhaps the most important activities of this operation

Type of method selected, reservoir properties and well characteristics will influence the specifications of the gun specifications and the operational procedures

Performance evaluation is based on final production/impairment results



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