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Module 7

FACTORS AFFECTING PERFORATION PERFORMANCE

CONTENT

- *Factors affecting gun performance*
- *Perforation damage*
- *Casing/gun clearance*
- *Casing and cement properties*
- *Well fluids*

FACTORS AFFECTING GUN PERFORMANCE

In addition to the design phase there are many operational factors affecting gun performance, these include:

- Operational time
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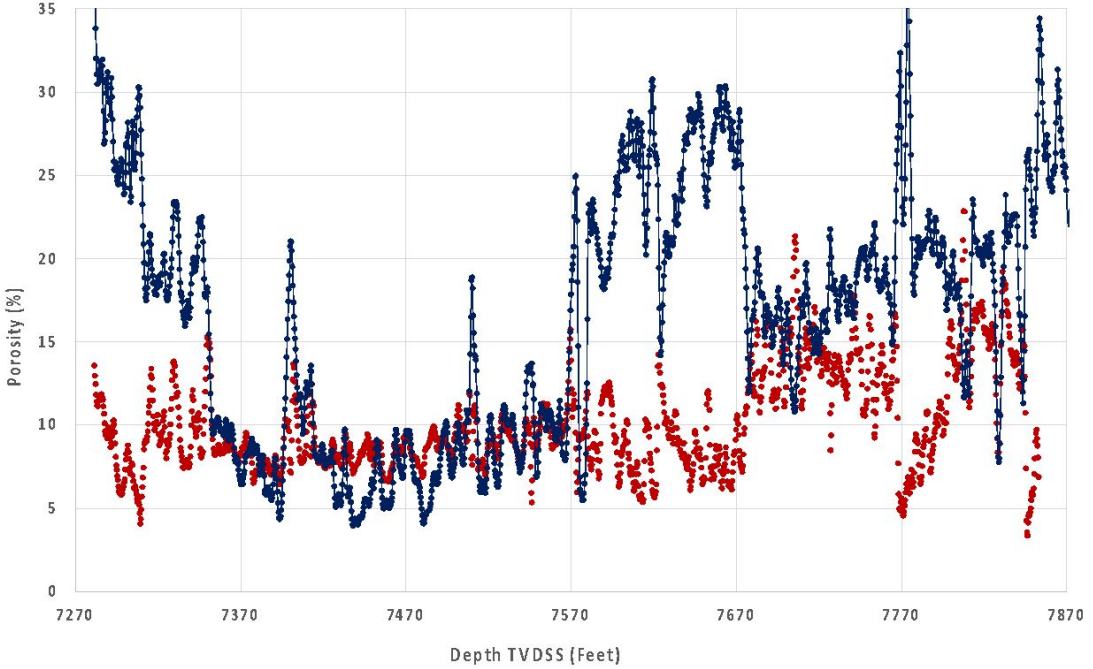
- Gun and casing positioning
- Type and specifications of casing and cement
- Well fluids, type and density
- Near wellbore petrophysical properties (Porosity and permeability)

FACTORS AFFECTING GUN PERFORMANCE (Continued)

Near wellbore porosity and permeability tend to be different from those original found in the reservoir. These affect shot penetration.

- The near wellbore porosity will significantly change due to drilling and completion
- Areas of higher porosity tend to “absorb” energy from the penetrating jet limiting its reach
- Rocks of low porosity tend to allow longer charge penetration due to the lack of interaction charge-rock

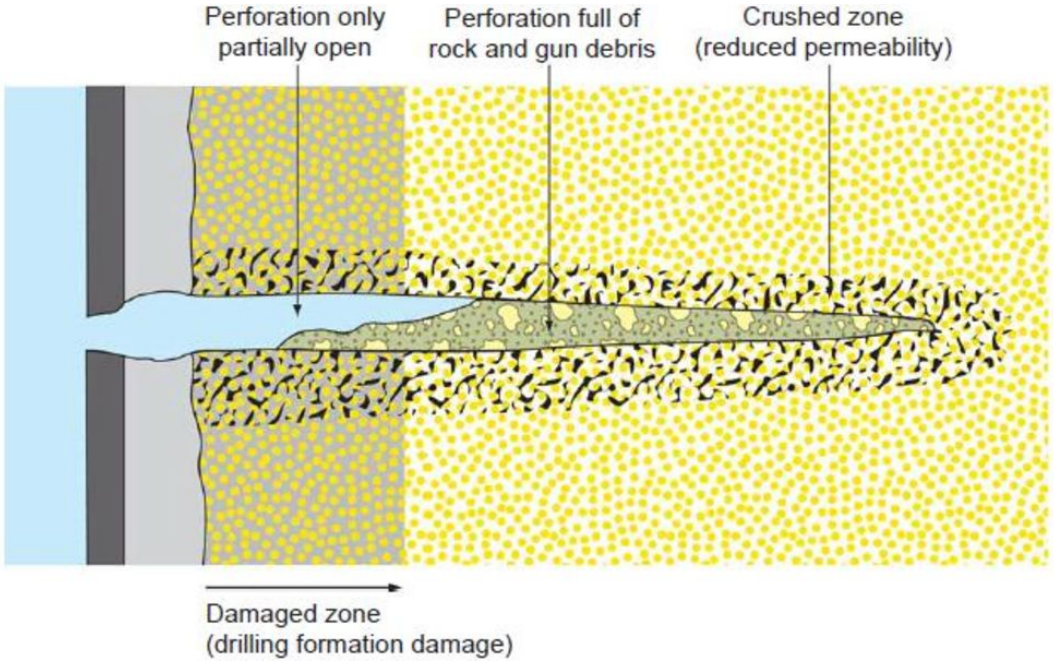


PERFORATING DAMAGE

Existing and newly created near wellbore damage will impact inflow and productivity, there over 50 types of formation damage. The ones caused by perforating include:

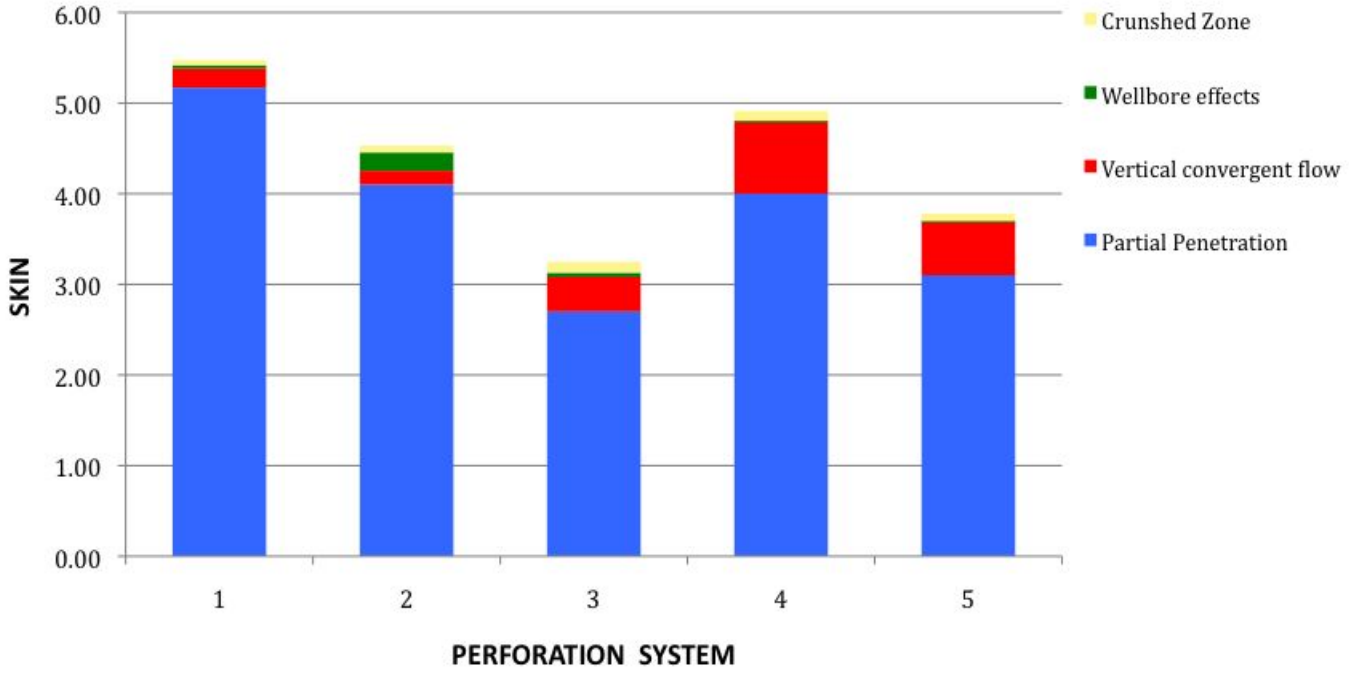
- Geometrical skin
- Partial penetration skin
- Grain crushing damage
- Flow convergence skin
- Wellbore wall effect

The most important one is the grain crushing damage as it modifies the porosity/permeability of the near wellbore



PERFORATING DAMAGE (Continued)

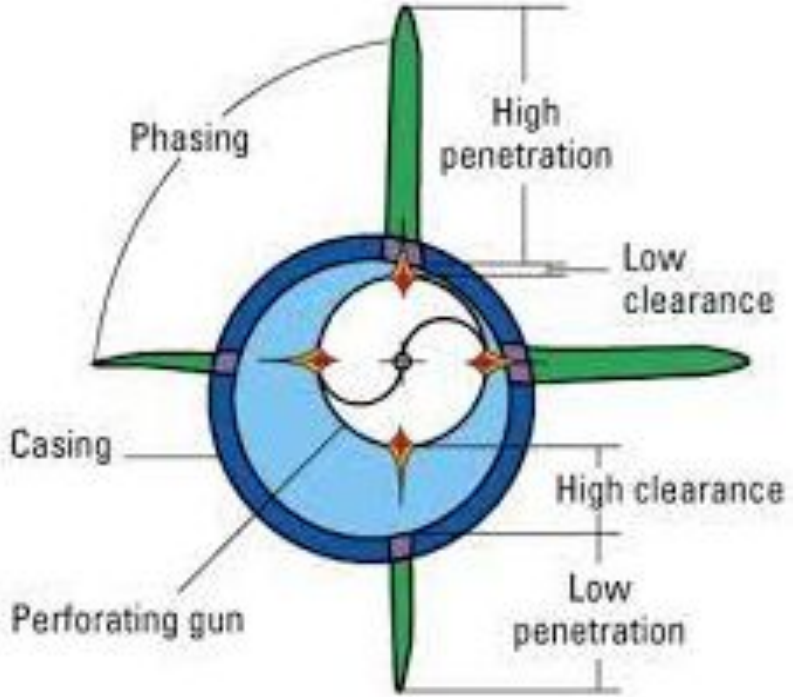
Example of perforating damage for 5 different gun specifications



CASING / GUN CLEARANCE

Position of the gun with respect to the casing is very important and can affect charge penetration.

- The closer the gun is to the casing the longer the penetration of the charge into the reservoir
- Fluid in the annular space has an cooling effect on the expelling jet



TYPE OF CASING AND CEMENT

Steel casing and cement both can affect significantly gun perforating.

- The closer the gun is to the casing the longer the penetration of the charge into the reservoir
- Casing wall thickness and grade need to be considered
- Cement sheet, thickness and compressive strength influence penetration

MODULE 7 - SUMMARY

COMPONENT	PENETRATION	DENSITY	SIZE	PHASING	DRILLING DAMAGE
Casing / Gun tolerance	▼	▼	▼	▼	▼
Gun standoff	▼	▼	▼	▼	▼
Charge performance	▼	▼	▼	▼	▼
Casing/Reservoir properties	▼	▼	▼	▼	▼
Completion / Gun size	▼	▼	▼	▼	▼
Deployment method	▼	▼	▼	▼	▼
Type of formation	▼	▼	▼	▼	▼
Well fluids	▼	▼	▼	▼	▼
Cleanout method	▼	▼	▼	▼	▼
Well pressure & temperature	▼	▼	▼	▼	▼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