IWCF Petroleum Engineering Definitions

Well Integrity Management:

The management of well integrity is a combination of technical, operational and organisational processes to ensure a well's integrity during the life cycle of the well.

This may be better explained as:

A well integrity management system is the application of i) technical, ii) operational and iii) organisational processes in an organisation to reduce risk of an uncontrolled release of well fluids, and, to operate the well in a safe manner during the complete life cycle of a well.

The technical element will describe:

- Legislative and organisational standards
- Well design and construction criteria
- Barrier philosophy and integrity acceptance criteria
- Equipment selection criteria
- Well operations and intervention guidelines.

The operational element identifies procedures to allow the wells to be operated during their lifetime with a minimum of interventions due to failures of well barrier elements:

- Normal well operation during production
- Well handover process
- Well intervention
- Maintenance on barrier elements
- Monitoring programmes and regular integrity tests.

The organisational element will increase the awareness of staff of the well status at all times by:

- Identification of well categorisation and barrier status at regular intervals
- Controlling the Management of Change process
- The availability of dedicated accountable positions/functions in the organisation
- The accessibility and control of correctness of well data such as:
    - Well construction data:
        - Well diagrams
        - Maintenance history logs
        - Handover certificates
        - Integrity test certificates.

Formation Pressure

The formation pressure is defined as the pressure at which a fluid or gas exists in the pores of a permeable rock. This is also called pore pressure.

Formation pressures are normally classified into three groups:

1. Normal Pressure

If the fluid in the pores is subject to hydrostatic pressure only, and the hydrostatic head is proportional to the vertical depth of the formation in the well, the pressure is said to be normal.

Normal pressure is between 0.433 and 0.465 psi/ft.

2. Abnormal Formation Pressure

The formation pressure is greater than normal formation pressure, this can be caused by:

- Compaction of the formation containing the fluid.
- Water squeezing out of the pores of surrounding clays or shale by compaction.
- Folding, faulting and thrusting, production compaction pressures and more traps.
- Thermal expansion due to increased temperature.
- Alteration in the rock constituents by temperature, pressure etc.

If the resulting formation pressures are above 0.465 psi/ft they are said to be abnormal.

3. Subnormal Formation Pressures

These are formation pressures, which are measurably less than normal. Subnormal pressures are below 0.433 psi/ft.

Fracture Pressure

The amount of pressure a formation can withstand before the formation breaks down as a fracture is initiated, followed by loss of fluid, also defined as Formation breakdown pressure.

Leak Off Pressure:

The amount of pressure the formation can withstand before the formation accepts any fluids.

Inflow Test

When the barrier cannot be tested in the direction of flow an alternative test is required. The existing well pressure at the upstream side of the barrier is used as test pressure. Barriers like these include:

- The lower master valve
- Wireline plugs
- Packers.

The barrier is closed and the section downstream the barrier is bled down. The bled down section of the tubing or flow line is then closed against a tested barrier. The pressure in the section will be monitored for any pressure increase. If no pressure increase is monitored the barrier is successfully tested.

Well Barrier Envelope

A combination of one or more well barrier elements that together constitute a method of containment of fluids within a well and prevent uncontrolled flow of fluids flow into another formation or to escape at surface.