COLORADO
Oil & Gas Conservation Commission
Department of Natural Resources

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Practices and Procedures
Mechanical Integrity Tests
Revised July 6, 2014

Purpose

The purpose of this document is to explain key aspects of the rules, regulations, practices, procedures, and policies pertaining to mechanical integrity testing for both idle oil and gas wells and Class II underground injection control (UIC) wells within the State of Colorado. An **IDLE WELL** shall mean a well which is shut-in longer than two years, temporarily abandoned longer than 30 days, or waiting-on-completion longer than two years. Further, a **SUSPENDED OPERATIONS WELL** shall mean a well in which drilling operations have been suspended prior to reaching total depth and at least one casing string (the surface casing) has been set and cemented in the wellbore. This definition does not include wells in which only conductor pipe has been set, and the surface hole has not been spud.

MIT of Idle Wells and Alternate Production Methods

There are a number of wells that produce under production packers or are produced intermittently through swabbing of the well. Usually these methods are used for lower producing or lower pressure wells. Because of these alternate production methods it is difficult to determine casing integrity based on production reporting alone.

Wells that are produced with a production packer or alternate method of isolation of the production perforations shall require a MIT within two years of the date the well was configured with the production packer, then every five years after the initial test.

Wells that are produced by swabbing shall require a MIT within two years of the date swabbing for production began, then every five years after the initial test.

Test for Idle Wells

SHUT-IN wells must pass a mechanical integrity test (MIT) within two (2) years of the initial Shut-In/Waiting-on-Completion/Suspended Operations/Swab/Production Packer installation date. A MIT shall be performed on each Shut-In well at five (5) year intervals from the date of the initial MIT (Rule 326.b.(1).

For the purpose of this document, Temporarily Abandoned wells are wells where surface equipment is removed, disconnected, or the well becomes incapable of production through setting of downhole plugs or any other means.

Shut-In/Waiting-on-Completion/Suspended Operations/Swab/Production Packer wells that are Idle for two (2) years or more must pass a MIT prior to being produced.

A MIT is required after *any* downhole casing repair of a well and prior to resumption of injection or production.

5 – Year UIC Test

UIC wells require a minimum of one MIT every five (5) years (Rule 326.a.(4)A) and *that test must be witnessed by COGCC staff*

Test Notification

Operators must provide COGCC staff ten (10) days notice prior to a MIT (Rule 316B and Rule 326.c) through submission of a Form 42. Operators shall contact COGCC staff to update them of any changes in the scheduling of a MIT after a Form 42 has been submitted.

Witnessed MITs

If COGCC staff is to witness a MIT, the operator is required to provide two (2) copies of the Form 21 Mechanical Integrity Test, one for each party. The header panel, "reasons" panel, and pre-test well configuration information (Injection/Producing Zone(s), Perforated Interval, etc.) shall be completed by the operator prior to the test. The Test Data panel (and Part II as needed) will be filled in by the COGCC field inspector. The two (2) copies of the Form 21 shall be signed by both parties. For witnessed MITs, pressure recordings are not required but are recommended. *All UIC tests are to be witnessed.*

Non-Witnessed MITs

If a MIT is not witnessed by COGCC, the operator is required to file a Form 21 and an original pressure chart (Rule 316B) within thirty (30) days of the test. The chart may be a circular recording set with an appropriate rotation rate (clock rate one (1) revolution per hour is appropriate) and pressure range. For example; a zero to ten thousand (0-10,000) psi pressure range is not appropriate for a three hundred (300) psi pressure test. The chart should include the pressure run up from zero (0) psi, the test itself, and pressure run down to zero (0) psi. Alternatively, the test may be recorded by a data logger and the COGCC provided with A.) Pressure versus Time plot of the test including the pressure run up, the test, and the pressure run down and B.) A data table containing pressure values at no longer than one (1) minute intervals (no shorter than fifteen (15) seconds requested). The Pressure versus Time plot shall have legible axes with a scale appropriate for the test pressure.

General - Mechanical Integrity Test Procedures

To minimize the chance of masking the discovery of a leak due to rapid temperature changes causing fluid expansion or contraction within a constant volume space, operators should:

> Completely fill the casing-tubing annulus with liquid(s) at least twenty-four (24) hours before the test. When possible, pre-test the well before the COGCC staff member leaves his/her office to avoid unnecessary trips to the field.

To stabilize the well prior to the MIT operators should:

1. For Idle wells conduct the test only if the well has been shut in a minimum of eight (8) hours, *or*
2. For actively injecting wells (i.e. UIC wells) conduct the test only if the well has been injecting continuously for over eight (8) hours.

The test must be at least fifteen (15) minutes long. To pass, the well must not lose or gain more than ten percent (10%) of the initial test pressure. Rising pressures greater than ten percent (10%) in the casing-tubing annulus or casing during a test will invalidate the test. The well will have to be re-tested in this case.

A zero (0) psi initial test pressure is not acceptable. The initial test pressure shall be a minimum of three hundred (300) psi. The well must maintain at least three hundred (300) psi after run up. It is suggested

that the initial test pressure be one hundred ten percent (110%) of the desired approved pressure rating, this would include the allowed ten percent (10%) pressure decline. For example; if the required pressure for well operations is one thousand two hundred (1200) psi, the test should be run at on thousand three hundred twenty (1320) psi.

Packers or bridge plugs must be set one hundred (100) feet or less above the highest production perforation (Rule 326.b.(1).A, and Instruction #10 Form 21).

Perforations used for casing repair/cement squeezes are meant to be closed by cement, therefore the repaired casing is to be fully included in the MIT (i.e., repair perforations do not count as production perforations).

UIC Wells - Mechanical Integrity Test Procedures

The MIT shall be performed at average operating injection pressure. Testing at the average operating pressure will not result in the test pressure becoming the new maximum injection pressure. If the average operating injection pressure is less than three hundred (300) psi, then the initial test pressure must be three hundred (300) psi. plus 10% to allow for pressure decline. Generally, tests will not be run more than three hundred (300) psi above maximum injection pressure.

The test pressure must have at least three hundred (300) psi differential pressure between the tubing pressure and the casing-tubing annulus pressure during the test and must not drop below three hundred (300) psi during the test.

At its discretion, prior to or during the test, COGCC staff may require the casing/tubing annulus to be pressured up to the maximum approved injection pressure.

The initial test performed to fulfill permitting requirements MUST be at the maximum approved injection pressure.

Note: Because casing and cement integrity are not involved, tubing and packer repair or replacement in UIC wells needs no prior approval. However, a MIT is required to test the new configuration. The repair or replacement should be reported on the Form 21 under Part I - Verification of Repairs in the "Describe Repairs" field.

Failing Mechanical Integrity

A leak in wellhead seals, casing, tubing, or packer indicates a loss of mechanical integrity (Rule 326.d) and therefore constitutes a failure.

A decrease or increase in test pressure of greater than ten percent (10%) during the fifteen (15) minutes of the MIT shall constitute a failure. Tubing and casing mechanical integrity shall be maintained in all UIC wells and casing integrity shall be maintained in all Idle Wells. Failure to maintain mechanical integrity shall be considered a violation of Rule 326.d with a Notice of Alleged Violation issued.

Tests where the pressure drops continuously during the test but are still within the ten percent (10%) threshold will be given special scrutiny and may be rejected. "Flat" test curves are preferred. Curves that decline but "flatten out" at some point during the test are acceptable.

All wells lacking integrity shall be repaired or plugged and abandoned within six (6) months of discovery (Rule 326.d.). Prior approval via a Sundry Notice (Form 4) for casing repair (Rule 317.d.) or a Well Abandonment Report (Form 6) Notice of Intent to Abandon (Rule 311) is required.

Immediately upon discovery, all injection wells lacking mechanical integrity shall be shut in and physically ***disconnected*** (per Rule 326.d.). The operator shall notify COGCC staff of any leak as soon as practicable.

Disclaimer

If any conflicts are found between this guidance and the Colorado Oil and Gas Conservation Commission's (COGCC's) or Environmental Protection Agency rules or policies, the rules shall govern. Current COGCC rules, regulations, policies, and forms are available on the COGCC web site at www.colorado.gov/cogcc. Federal regulations can be found in 40 CFR parts 144-147 and EPA Region VIII Section Guidance No. 39.