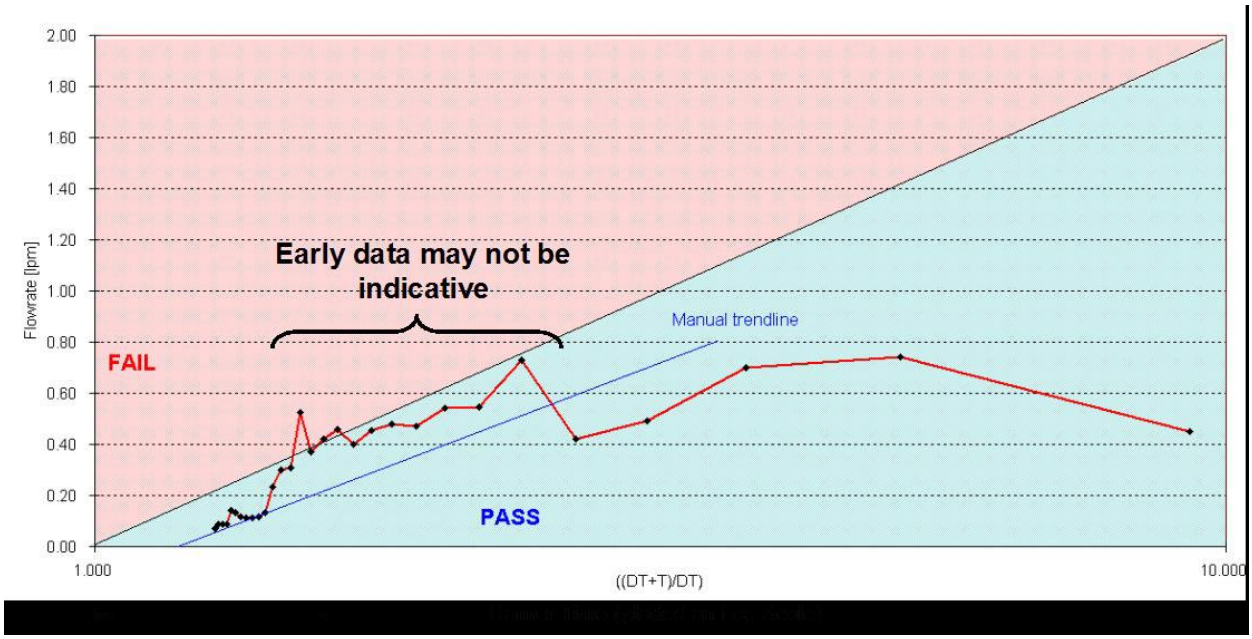
APPENDIX: HORNER PLOT GUIDE

Reference: New PCM, Inflow testing procedures.

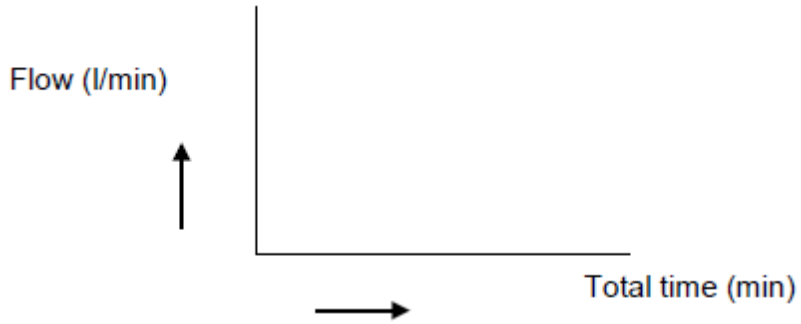
1. During inflow test, periodically measure rate of flow at ±10-minute intervals.
2. For each sample point, calculate: Horner Time = ((T+dT)/dT) where T is the time since the last circulation until the start of the inflow test (in minutes; may be taken as an arbitrary 60) and dT is the time since the start of the inflow test, recorded in minutes.
3. On the Y-axis, plot rate of flow (L/min) on a linear scale.
4. On the X-axis, plot Horner time on a logarithmic scale.
5. Interpolate between sample points with a straight line if possible. Exponential rate decay should plot linearly.



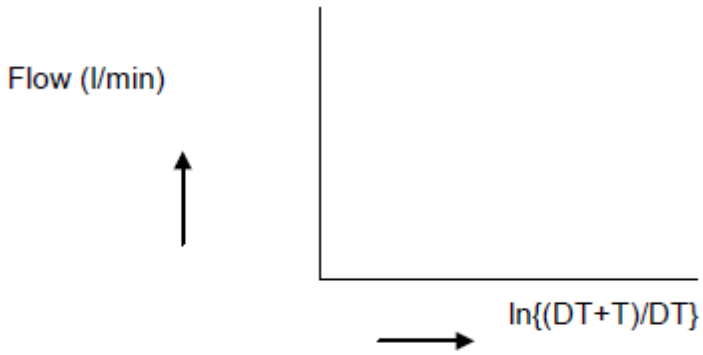
The plot above is based on data from a real case. As depicted, early data can be erroneous for various reasons. The inflow test should be continued for as long a period as necessary until a definite trend is observed; this trend should be indicative of either flow from the well (FAIL), or thermal expansion (PASS). If the projection of the final trend clearly indicates an intersection of the X-axis at or before infinite time (Horner time = 1), the test can be considered successful because the flow will eventually cease before infinite time. If the projection trends towards an intersection of the Y-axis (indicating flow at infinite time), the test can be considered a fail. If the intersection of the final trend is in doubt, other variables should be considered to confirm the result, such as possible gas on bottoms-up circulation after an inflow test.

Using the Horner plot provides an opportunity to optimize inflow testing by reducing, as much as possible, the subjective nature of the "reducing trend". The test should be continued until a definitive trend has been established. An early termination of an inflow test may lead to an indeterminate result.

1. Plot flow rate over elapsed time.



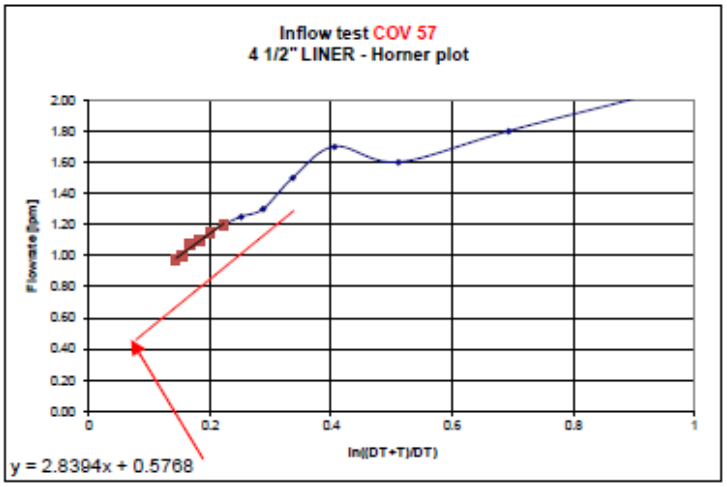
2. Use a Horner plot as per available xls Horner plot spread sheet.
3. Measure delta volume over delta time.
4. Construct Horner plot.
    a. On the Y-axis, plot rate of flow (L/min) on a linear scale.
    b. On the X-axis, plot Horner time on a logarithmic scale.



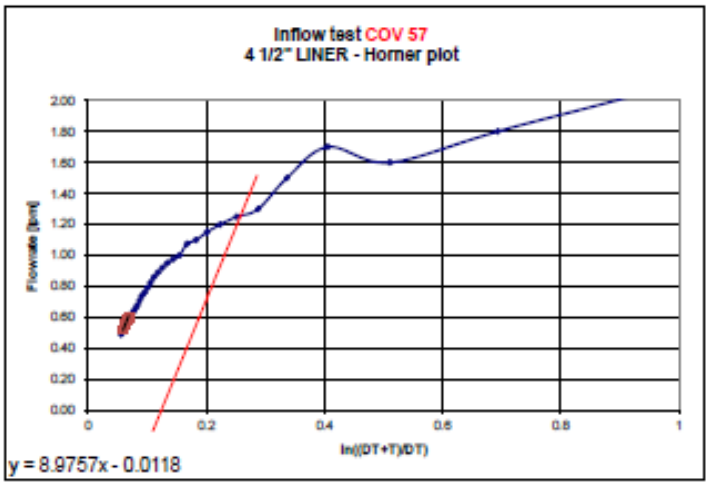
- DT = total time (min)
- T = time interval (min)

Horner plot acceptance criteria:

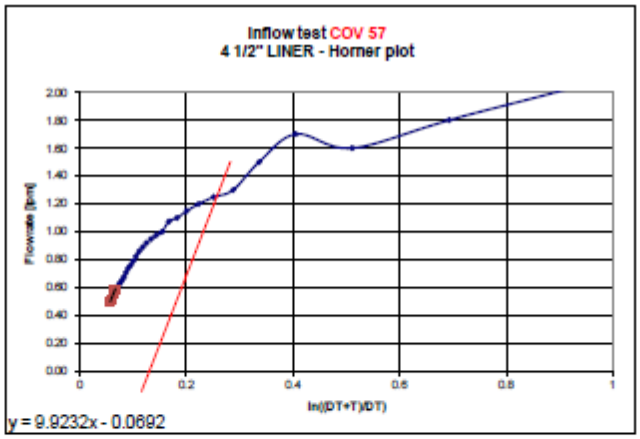
1. Minimum inflow test duration is 1 hour and 20 minutes.
2. Record volume every 10 minutes.
3. Establish a linear regression trend line over the last hour (at least six data points).
4. As long as the calculated linear trend line over the last hour shows a positive constant, the test has not been completed or indicates a failure.
5. The reduction from the linear trend line constant every hour will give an indication if the test is progressing well.
6. When the calculated linear trend line constant is negative (line crosses Y-axis below zero), qualification of the test starts (first of the three points required).
7. Three consecutive linear regressions over the last 60-minute interval (T = 60 minutes, T + 10 minutes = 70 minutes, T + 20 minutes = 80 minutes) with a negative constant in combination with 3 consecutive decreasing volume measurements will qualify as a good test.
8. A spreadsheet for the Horner plot is embedded below:
9. Linear regression on the last six data points covering in at least 60 minutes shows a constant> 0.



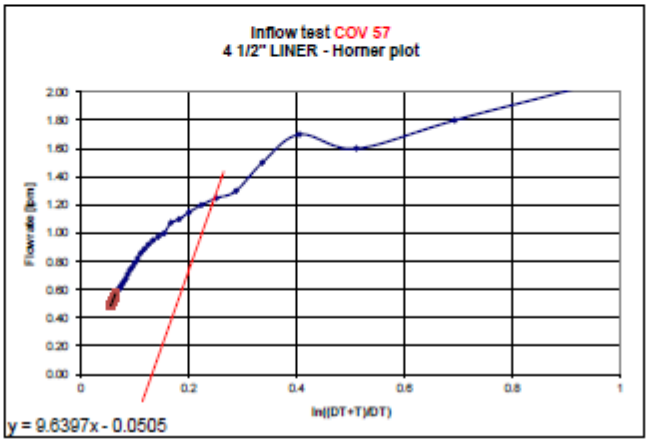
NOTE Linear regression on next three evaluations (T, T + 10 minutes, T + 20 minutes) shows a constant < 0 and so the test is accepted.



Time: T



Time: T + 10 minutes



Time: T + 20 minutes