Operational Aspects of Horizontal Wellsite Geology – Improving Results

Gord Copp*, South Central Business Unit

Much information gathered from the field, may be lost, or considered unimportant by the in-house geologist, when in fact the information may be of extreme value, equivalent to a strat test. Good communication is the first step to success, and starts with time spent with the field geologist in town. As much useful information as can be gathered should be passed on to the well-site team. Cross sections, seismic sections and possibly a day or two at the core lab prove very useful when milling over a decision at 3:00a.m. whether to go up or down.

Contingencies should be discussed at length. The successful operation to me hinges on good management from the office. The successful team is a happy team with a coach and well informed as to what is going to transpire during the drilling operation. Surprises should be mitigated. Many opportunities are missed by not tapping into the right knowledge pool. Problems can arise by overdoing the operation. Think about the complexity of drilling within a half meter vertically one mile into the subsurface and staying there for long lateral distances. Also if one is to get out of the zone, have contingencies ready and in place, i.e. select an interval whereby one will wait until one does a correction to the bit.

Remember the bit is typically 10-17 metres behind the survey. This is an extremely important point to be aware of. Decisions are made at what is believed to be going on at the bit.

If the office becomes involved this very simple concept seems to be overlooked. To me it is one of the single most important aspects of successful horizontal drilling.

The wellsite geologist job, is to locate the well stratigraphically in the best pay possible. This is very achievable by having a properly co-ordinated team, and doing small minor adjustments to the well-path along the way. An increase in pay is never attributed to the well-site geologist, but I can tell you, a conscientious and proactive wellsite geologist will almost always achieve extra pay. Whether to run gas detection is simple, it is another tool to retrieve information and should be used. Horizontal wells generally lack information, and any additional, useful information is imperative. I am also of the opinion that a well constructed strip log with a M.W.D. gamma is almost as good as down-hole logs -- and much cheaper. For example when drilling horizontals in the east Senlac pool, the difference between a 3.5 minute kelly and a 5 minute kelly was the difference between fair and excellent pay. These wells were logged and afterwards this was found to be the case. Once this relationship was established logs were run less frequently, thereby saving considerable amounts of money.

I also have my own opinions on intermediate casing. I believe the maximum draw-down of any horizontal well is going to come from the pay most proximal to the casing shoe --the heel. I am surprised at how lightly sometimes casing point may be taken. To me it is possibly the single most crucial position of the well-path. Clearly the zone should not be penetrated at all costs, for if one hits water early it is very difficult if not impossible to rectify the matter. Western Saskatchewan teaser zones were the order of the day, they often looked good in samples, etc., but may have been only 0.5 metres thick. The way to alleviate any potential problem is to be sure one has penetrated at least 0.5 metres of vertical zone, before making any corrections. Much geometry has to be kept in mind when drilling horizontally, and thinking in a horizontal sense rather than a vertical sense. I think it is very important that office geologists fully understand the capabilities and limitations of horizontal drilling. This is achieved by getting ones hands dirty at the wellsite. Washing and cooking oil soaked samples, thawing frozen gas lines, all at the same time as being the co-ordinator of the directional people and the drillers, a new respect will be gained for the scope of the job.

Generally speaking fast drilling means porosity. Sliding and orienting are the same thing, and it means that the tool face has been set and now a preferred direction is being drilled, but the entire drill string is not rotating, only the Mud Motor, so it should be slower, but only in a relative sense. Once can sometimes tell by the slide times if one has hit into something harder - i.e. less porous, and alleviate a possible wrong decision before it becomes a big problem.
If a person is uncertain which way to go in a horizontal well, then my opinion is do nothing. It is generally very
difficult to undo a wrong decision. The office person must be careful when on the wellsite to work with the
horizontal geologist and to nurture feedback from the consultant.

The optimal length of a conventional overbalanced horizontal well is always a hot topic. The longer one spends in a
hole, the greater the damage will be to a zone. The horizontal well plan should be adaptable to whatever conditions
become apparent.

If it is going to take three days to add an extra hundred metres of pay, because you are searching for the pay zone, it
may be a good call to shut down the operation, if a reasonable amount of good pay has been penetrated.

Directional drillers are extremely valuable, and it should be conveyed to them that the pay is more important than an
arbitrary sub-sea elevation. Their job is to hit the numerical target given them by the Geologist or Engineer. It is
the Geologist’s job to be absolutely certain about boundaries, well-paths, spacing units etc. and this should be very
clear on the horizontal plan. The azimuth (direction) of the well-path has always troubled me. The azimuth was
usually a best-fit line to drill the horizontal well. When it gets onto the plan, it becomes the gospel, and often times
a well-path is strongly turned to get back on the line, when all it was, was a line on a map to begin with. If it doesn’t
matter (within reason), let everyone know it doesn’t matter. Give it a range if that is what is needed, plus or minus
20 metres is a fairly easily achievable line without an excessive amount of compensation needed.

Multi-well programs are almost certainly better then one shotwonders. A team concept is very important, and this
may be achieved with the right people after some time with the other faculties. Consultants are generally more
willing to commit to a multi-well program. One tends to notice the A.F.E. generally drops as a program continues,
and the team becomes more proficient.