

CASE 3

RESMAN Tracers Identify Location of Water Break-Thru

In many fields world-wide, water injection is used to displace the oil towards producing wells and provide pressure support. The efficiency of this process affects the ultimate recovery of oil from the reservoir. Understanding where water is migrating helps operators make more informed reservoir management decisions to improve sweep efficiency.

Figure 1: Tracer Integrated Into Premium Sand Screen



RESMAN HAS DEVELOPED Intelligent Tracers that are deployed in the completion across the reservoir interval. These tracers provide insight into the location of water break-through. They lie dormant until activated by water produced from the reservoir at which time they release their unique chemical fingerprint (tracer). Samples of the produced water are analyzed and the concentration of the tracers provide insight to where water production has initiated along the reservoir interval.

In this application, the tracer was formed into long strands known as 'filaments' and inserted into the premium screen between the outer shroud and the mesh layer. Some premium screen designs support this installation approach due to the space between the shroud and the mesh. The tracer can be deployed in a variety of forms to accommodate almost all screen types. Special designed carriers are utilized in situations where integration into existing completion components is not practical.

Figure 2 illustrates the location of screen joints containing tracer filaments. Each vertical line represents a screen joint containing tracers. The different colors represent the four unique tracer fingerprints that were utilized in this application.

Figure 2: Deployment of screens along the reservoir interval

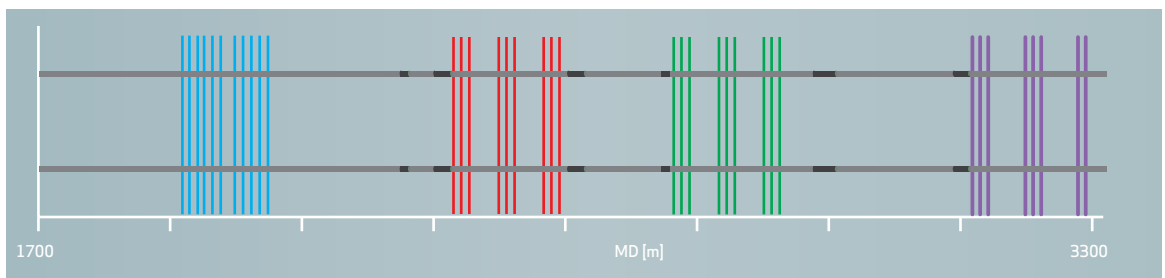
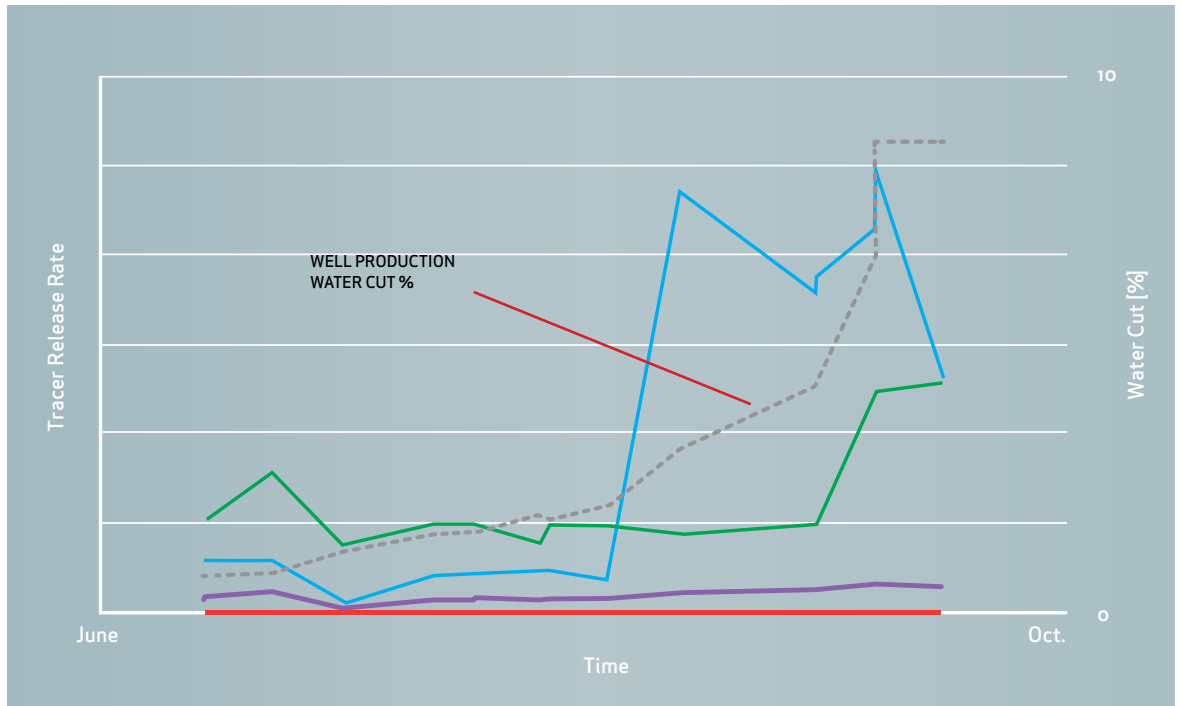


Figure 3 is a plot of the tracer concentration data for samples taken over a three month period. The colored lines correspond to the colors of the tracers in Figure 2.

Figure 3: Tracer response curves



The dashed line illustrates the water cut of the well's production at the time of each sample.

Figure 4 highlights the first water break-through event. Point A highlights the point where the blue tracer shows a jump in concentration that corresponds to a change in the water cut curve. This indicates the rise in water production at this point in time, that is attributable to new water influx occurring in the interval of sand screens containing the blue tracers.

Point 'B' illustrates a similar event associated with the green tracers that occurs several weeks after event 'A'.

Figure 4: Water Break-Through Events

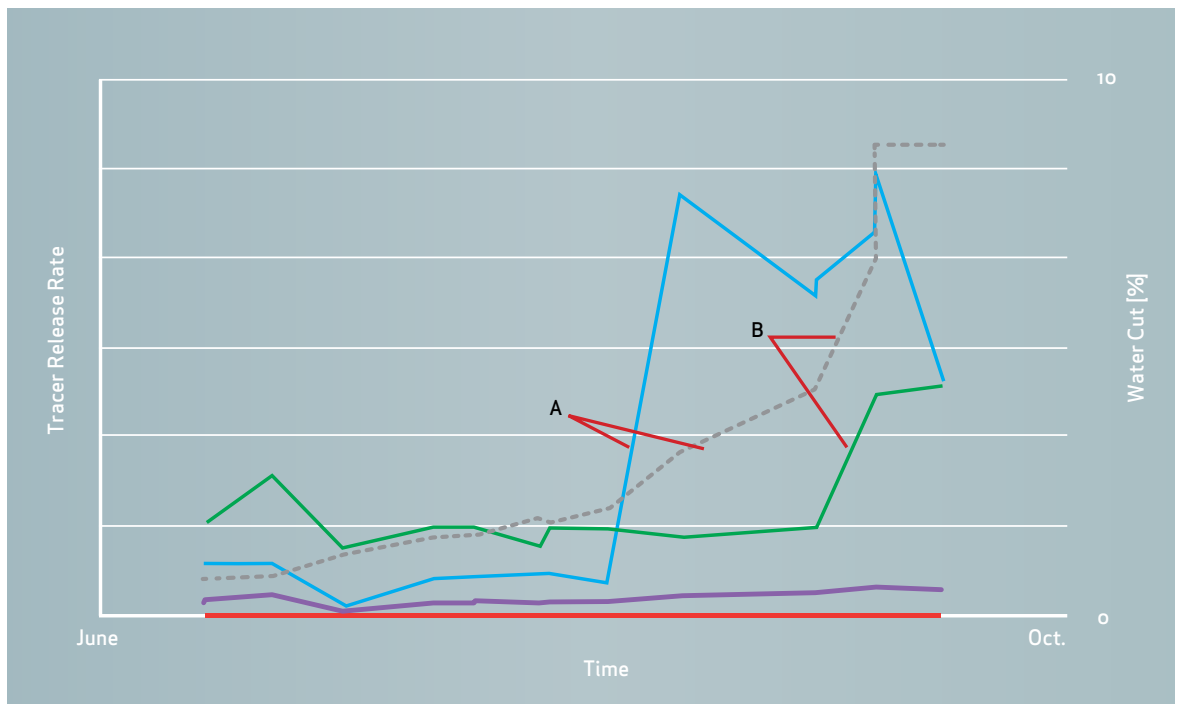
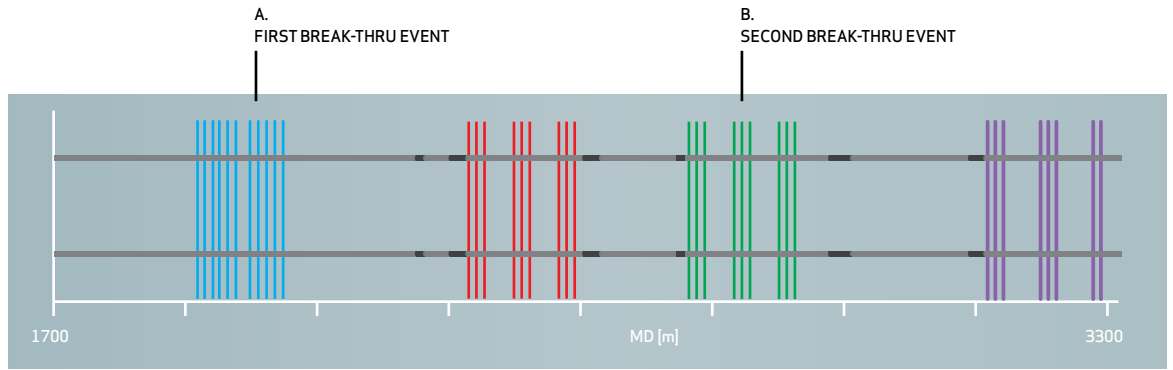


Figure 5: Water Break-Through Timing and Location



By understanding where water break-through's are occurring at different points in time allows the operator to track flood fronts and better understand how water is migrating through the reservoir and therefore more optimally manage the reservoir.