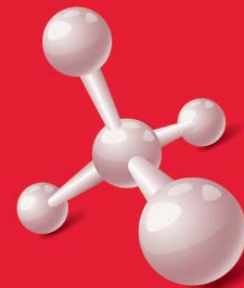


# Solutions

## for identifying injector to producer connectivity



### Chemical Tracers

#### APPLICATION

Chemical tracers can be pumped into waterflood injection wells while production wells are monitored for chemical breakthrough. By measuring tracer concentration in offset producing wells as a function of time, the following interpretation can be made:

- **Poor Sweep Efficiency:** Breakthrough time that is significantly lower than predicted matrix flow rates would suggest that fractures or high permeability anomalies communicate between the injection wells and producing wells. This rapid channeling leads to poor sweep efficiency and low oil recoveries.
- **Directional Permeability:** In some cases, a tracer may break through in some wells but not in others. If there is a pattern to this breakthrough, directional permeability may be the cause. Identifying this problem can lead to solutions that improve oil recovery throughout the pattern.

#### DESCRIPTION

The tracer is made of a stable salt that is not naturally present in oilfield waters. Before injection, baseline water samples are collected at the injector and the offset producers. The tracer is injected in a low volume high concentration slug. The salt propagates through the reservoir and adsorption is minimal. Samples are collected at the offset producers daily and sent to the laboratory for evaluation. Sampling period and frequency are dependent on anticipated breakthrough time.

#### ADVANTAGES

- Low cost chemical with no radioactive properties
- Can be used in almost any type of mix water
- Pumped with standard oilfield equipment
- Minimal interruption in waterflood operation
- Laboratory evaluation included in technology package

#### CRITICAL DESIGN FACTORS

- Patterns with known injector-producer connectivity are excellent candidates
- Minimum efficient injection rate must be sustained
- Breakthrough times of manageable length must be anticipated – breakthrough times of more than two months are inconclusive