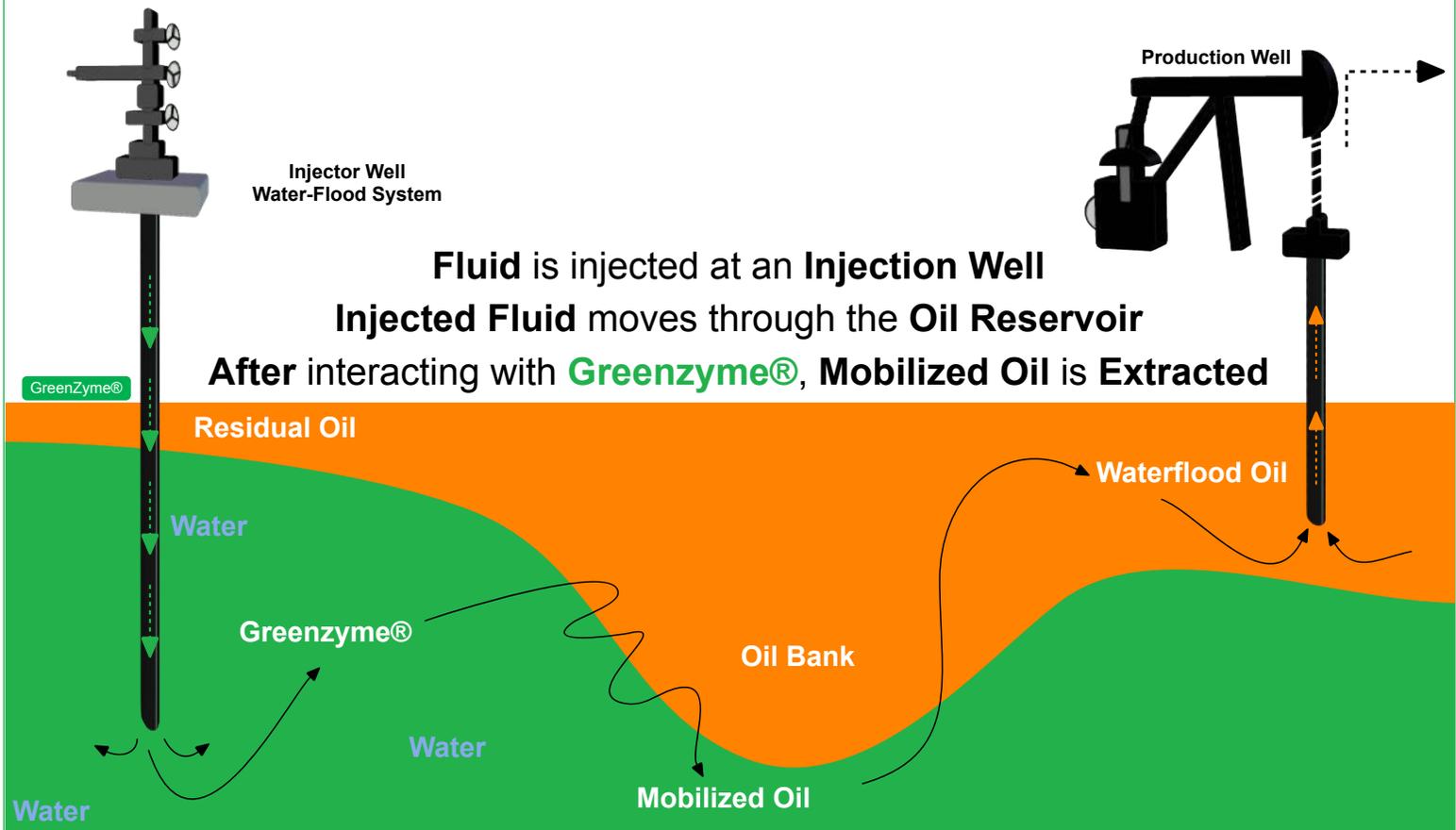


## Greenzyme® Flood Mechanism



### WATER-FLOODING DRIVE PROCESS

Since **GreenZyme®** is completely mixable in produced water, **GreenZyme®** can be diluted even to below 500 ppm level, and still be effective in "releasing" crude oil from sand surfaces in the formation, **GreenZyme®** is then an useful agent in all secondary oil-recovery drive process. The procedure is as follow:

#### 1) Quantity of GreenZyme® needed:

In a normal water-flooding drive, produced water is pumped from the injector wells with pressure towards the receiver-wells, which are the producer wells. Typical production engineer will estimate how many tons of produced water is needed to inject, and also estimate how many tons of crude oil this cycle of injection will produce before repeating the next cycle of water-flooding drive.

Under normal water-flooding drive, calculate the quantity of **GreenZyme®** needed at 500 ppm strength from the total tons of water used, say 16-drums of **GreenZyme®** concentrate in this cycle. The production engineer has the number of drums of **GreenZyme®** needed (16 drums).

## 2) How to apply the required number of GreenZyme® drums into this water-flooding drive?

You do not need to use an external tank to dilute the 16-drums of GreenZyme® to 500 ppm level before injection.

Why? Because we can use the underground formation as a mixing-tank, since GreenZyme® is easily and instantly mixable with produced-water in the underground formation.

How to do this?

Say we need 16-drums of GreenZyme® concentrate for this drive, we propose a 4-steps dilution-injection stage, each stage contains 4-drums of GreenZyme® concentrate:

**Step 1:** Dilute the first 4-drums of GreenZyme® concentrate to 10% strength using an external tank and produced-water, pump this 10% GreenZyme® into formation, followed by the first part of 1/4 total of regular produced-water injection.

**Step 2:** Repeat step 1 above, dilute the second 4-drums of GreenZyme® concentrate to 10% strength using an external tank and produced-water, pump this 10% GreenZyme® into formation, followed by the second part of 1/4 total of regular produced-water injection.

**Step 3:** Repeat step 1 above, dilute the third 4-drums of GreenZyme® concentrate to 10% strength using an external tank and produced-water, pump this 10% GreenZyme® into formation, followed by the third part of 1/4 total of regular produced-water injection.

**Step 4:** Repeat step 1 above, dilute the final 4-drums of GreenZyme® concentrate to 10% strength using an external tank and produced-water, pump this 10% GreenZyme® into formation, followed by the fourth part of 1/4 total of regular produced-water injection.

After all 16-drums of GreenZyme® injection is finished, resume normal crude oil production.

Please notice this: Significant crude oil increase will happen only after the injection of produced-water eventually reaches the producing oil wells, this may happen in weeks, sometimes in months, depending on how far away the distance between injection well and the producing well and also the geological formation-profile underground.

What is the difference by using GreenZyme® in water-flooding drive versus without use of GreenZyme® at all?

The differences are as follow:

1. The injection-cycle using GreenZyme® will produce significantly more crude oil than the cycle without GreenZyme®.
2. The injection-cycle using GreenZyme® will extend the period of time crude oil increment will last.
3. The pumping pressure is much less (i.e. using less pumping pressure means less energy costs) with GreenZyme® than the one without, and the total amount of liquid capable to be injected into the formation is also much greater than the one without GreenZyme®.