“EEOR”
Enzyme Enhanced Oil Recovery

Jumpstart Energy Services, LLC develops innovative oilfield applications with enzyme fluids that help operators increase production and recovery of OOIP. We call this “enzyme” enhanced oil recovery (EEOR). Jumpstart is authorized in North America and Trinidad for Stimuzyme®, a unique and proprietary enzyme fluid made in the U.S.

ABOUT ENZYMES
Enzymes are biological catalysts made of proteins that catalyze (i.e. significantly accelerate) specifically desired biological chemical reactions between a substrate (oil), the water medium and formation. The enzymes lower the activation energy needed for the reaction without being consumed. Enzymes can catalyze up to several million reactions per second. Our enzymes are engineered with an active site having a strong affinity for the oil.

ENZYME MECHANISM: HOW IT WORKS
The enzymes involved are in the Hydrolase (water soluble) class of Enzymes. Hydrolases catalyze reactions between a substrate (oil), formation and water, and bind water to certain molecules. In this way, larger molecules are broken into smaller ones. These enzymes also break various bonds in the oil environment to release and mobilize the oil.

FUNCTIONALITY
Because Stimuzyme® is not a live microbe, its use is uniquely different. As the active site attaches to the substrate (oil), it rapidly catalyzes and the oil is released into smaller droplets. This reduces interfacial tension (IFT), improves relative permeability and mobility. The enzyme will quickly release oil from sand, limestone or other solid formation surfaces, and production tubing, etc.

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Field Sample #1 (Top): This picture shows the top layer of a 15-18° API gravity oil sample mixed with sand that had a 10% enzyme solution added. Note the small droplet sizes as oil is released from sand.

Field Sample #2 (Bottom): Sand was added to 15-18 API gravity oil (same procedure as the above). A 10% enzyme solution was then added and mixed to one sample and water is added to the second sample. Note that the settled sand is clean on the enzyme solution (shown on the left) and does not stick to the glass, while the sand still bonds significant oil to the bottom of the water sample (shown on the right) and oil is adhering to the glass. See picture below:

Left jar: 10% enzyme solution, oil, sand  Right jar: Oil, sand and water
PATENTS PENDING / OILFIELD APPLICATIONS
Jumpstart is a leader in developing applications for EEOR. We’ve jointly filed three process utility patents and have “patent pending” status for cyclic steam, water-alternating-gas (WAG) and water flood injection applications.

Stimuzyme® is water soluble and oil insoluble. Jumpstart targets sandstone, water drive formations with <30° API gravity oil, >20% porosity and >100 md permeability, but is not limited to these parameters. We’ve also had successes in fractured formations. Formation pressure, production history, viscosity of crude and pour point are all factors that need consideration. Different types of tertiary recovery are factors too. Applications for enzyme fluid could include:

- Heavy oil (cold production)
- Cyclic steam injection
- Water floods
- CO2 or nitrogen injection (WAG)
- Stripper wells (target >5 BOPD)

Stimuzyme® is an enzyme solution made from DNA modified extracted proteins from oil loving microbes in a batch fermentation process. The final product is non-living and does not form micelles.

EEOR TECHNOLOGY
Stimuzyme® has shown positive results boosting medium to heavy oil production by 50-100% (or more). We’ve seen effective penetration of positive skin in clogged wells and increased recovery of OOIP post water-flood in independent lab tests. Jumpstart looks at combined EOR technologies where enzymes bring benefit to existing secondary or tertiary production.

CANDIDATE WELLS – CALL US!
Jumpstart identifies types of applications and well candidates for treating with enzyme fluid using screening criteria. We work directly with operators to review data for a particular well, field or lease as follows:

- Discuss properties with operator
- Complete well information form (see Jumpstart website)
- Screen and select candidates
- Complete Well Service Agreement* (Jumpstart will email a draft)
- Complete Jumpstart credit form

*Note: Jumpstart must have a completed and signed Well Service Agreement before treating a well or lease.
TREATING WELLS
Stimuzyme® is a concentrate fluid that is diluted according to a particular treatment method or type of application. This could range between 5-10% dilution factor to <1% potentially for a continuous water flood. Performing a “huff-n-puff” treatment that interrupts production will be different than a water flood treatment that utilizes various water injection wells and doesn’t interrupt production. Jumpstart works with operators to identify the treatment method and equipment needed (i.e. vacuum truck(s), etc.). All final decisions and oversight remain with the operator.

AGREEMENTS
Jumpstart Energy Services does not sell enzyme fluid. We deal directly with operators and charge well service fee per job or well treated (inclusive of the enzyme fluid). Freight and inventory costs are normally included as well. Pumping costs as well as the specific Well Service Agreements can vary by application, amount of enzyme used, location and type of formation.

PRODUCTION TECHNOLOGIES
Jumpstart works with small to large companies that have innovative oilfield production technologies and strategies to capture more OOIP. See Jumpstart’s “Links” at www.jumpstartenergyservices.com. We are also developing procedures as well as grades of enzymes to reclaim off-spec or salvage oil to meet crude oil sales specifications.