nanoActiv® by Nissan Chemical

OVERVIEW & CASE STUDIES

PRESENTED BY:

Nitro-Lift® TECHNOLOGIES LLC

The Exclusive U.S. Distributor of nanoActiv®.

OUR PARTNERS:

Nissan Chemical America Corporation

MESSER Gases for Life

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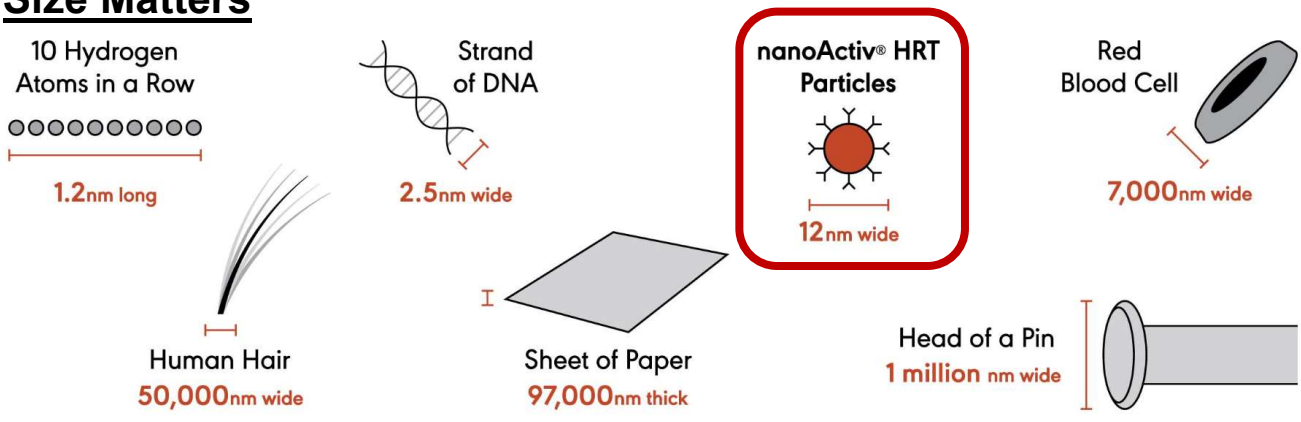
The Problems:

1. Existing oil and gas wells normally recover an average of 10% to 20% of Original Oil in Place (OOIP), leaving 80% to 90% of oil and gas in the ground.
2. Within the first year of production, horizontal wells decline 90%+, forcing the producer to drill more wells to keep cash flow up.
3. When new wells are drilled, adjacent wells (aka Parent Wells) experience a greater decline in production (aka a frac hit).
4. Producers maintain the ability to hedge price risk but lack a method to hedge volume risk.

The Solution:

nanoActiv® is a nanoparticle, developed by Nissan Chemical, that is pumped into existing wellbores. **nanoActiv®** enters microscopic pore throats and fragments hydrocarbon molecules that were previously unrecoverable using current technology. **nanoActiv®** is proven to increase recoveries in existing wells and protect wells from frac hits.

Size Matters

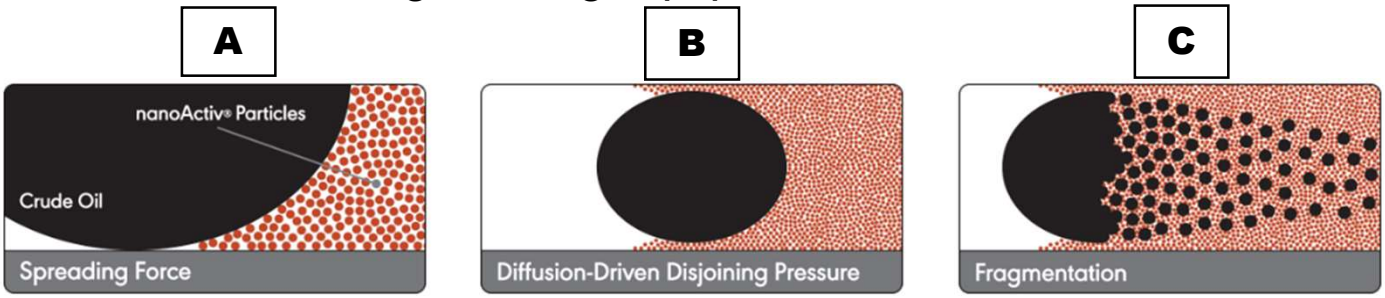


nanoActiv® particles are ~20,000x smaller than a grain of sand and ~10x smaller than a virus.

How Does nanoActiv® Work?

See our video library at: https://recovermoreoil.com/press-releases/

A. The nanoActiv formula is injected into the formation using nitrogen, carbon dioxide or water as a carrier fluid.
B. As nanoActiv moves through the reservoir, the particles mix with reservoir fluids in the pores and dislodge the previously immovable hydrocarbons by fragmenting into smaller droplets through Brownian motion.
C. The hydrocarbons flow to the wellbore and flow or pumped to surface using existing equipment.



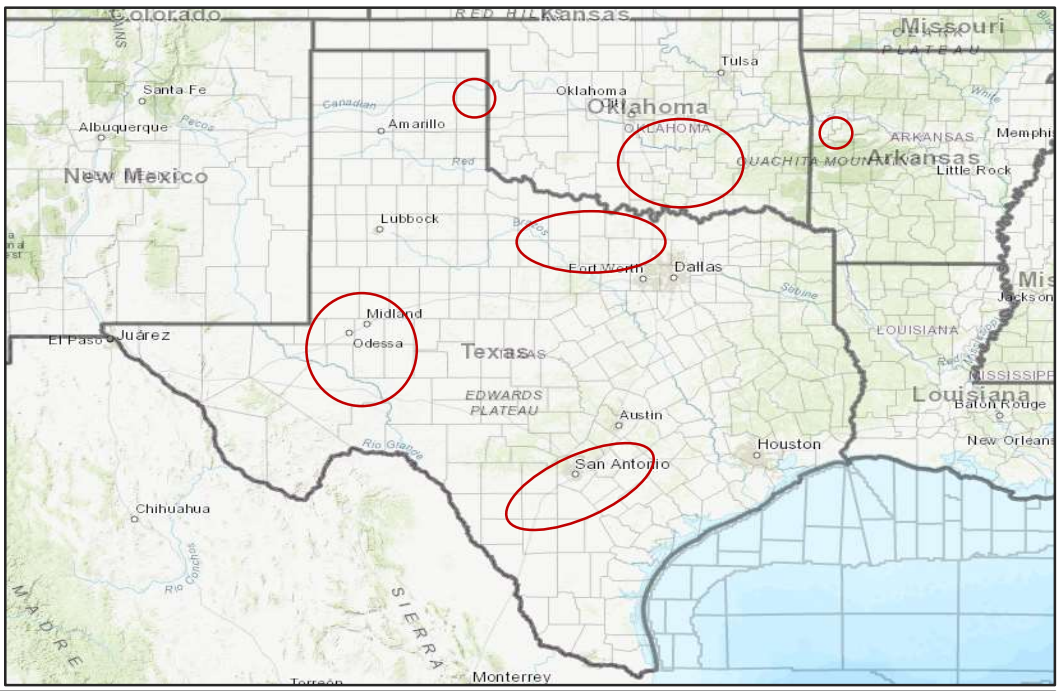
What are the success criteria?

- Mechanically Sound
- Existing pressure
- **Consistently** producing a minimum of 2Bpd or 50Mcfd
- Oil-wet reservoirs
- Low to medium water cuts
- High nanoDarcy to microDarcy (tight) permeability
- Minimal pressure depletion (for non-frac hit applications)
- Low salinity

Post Treatment Expectations

- **Horizontal EOR/Remediations: 10% to 40% increase on wells less than 24 months old. Older depleted wells may see increases of 30% to 100%+.**
- **Vertical EOR/Remediations: 50% to 500%+ increase.**
- **Frac Hit Mitigations: At a minimum, the wells treated should return to original production. Thus far, every case has increased above pretreatment production volumes.**

Areas of Treatment



Where we have seen success thus far:

Wells with:

- Oils with higher saturates and aromatics
- Liquids rich formations

What to be cautious of treating:

Wells with:

- High water cuts
- Heavy oil*
- High asphaltenes*
- High resins*
- No current production

While heavy oil, high asphaltenes/resins may be difficult to treat, it can be counteracted by an increase in nanoparticle concentration.

Payback

50-Day Payback Target

- For every $10,000 spent on a treatment the well must produce a minimal increment of total $200.00

100-Day Payback Target

- For every $10,000 spent on a treatment the well must produce a minimal increment of total $100.00

200-Day Payback Target

- For every $10,000 spent on a treatment the well must produce a minimal increment of total $50.00

Daily Incremental Volume to achieve payback at differing prices per $10,000 treatment cost.

Profit per Barrel of Oil or Mcf	50 Days Bopd or Mcfd	100 Days Bopd or Mcfd	200 Days Bopd or Mcfd
$25.00	8.0	4.0	2.0
$20.00	10.0	5.0	2.5
$15.00	13.3	6.7	3.3
$10.00	20.0	10.0	5.0
$5.00	40.0	20.0	10.0
$3.00	66.7	33.3	16.7
$2.00	100.0	50.0	25.0
$1.50	133.3	66.7	33.3
$1.00	200.0	100.0	50.0

"Profit per Barrel of Oil or Mcf"-example found on last page

EXAMPLE 1:
IF a producer treats a vertical well for $10,000 and the wells production increases from an average of 30 Boepd to 50 Boepd; the producer should expect a 100-day payback if their profit per BOE is $5.00 per barrel.

Return On Investment Example

Daily Incremental Volume to achieve ROI at differing prices per $10,000 treatment cost.

Profit per Barrel of Oil or Mcf	20% ROI Bopd or Mcfd	33% ROI Bopd or Mcfd	50% ROI Bopd or Mcfd
$25.00	1.3	1.5	1.6
$20.00	1.6	1.8	2.1
$15.00	2.2	2.4	2.7
$10.00	3.3	3.6	4.1
$5.00	6.6	7.3	8.2
$3.00	11.0	12.1	13.7
$2.00	16.4	18.2	20.5
$1.50	21.9	24.3	27.4
$1.00	32.9	36.4	41.1

"Profit per Barrel of Oil or Mcf"-example found on last page

EXAMPLE 2: IF a producer treated a 30-stage horizontal for $150,000 and has a profit per barrel of $15.00; the producer should expect a 33% ROI in a year if the well averages an INCREMENTAL 36 Bopd or 13,300 barrels in a year ($150,000÷$10,000=15 x 2.4= 36 Bopd).

EXAMPLE 3: IF a producer treated a 30-stage horizontal for $150,000 and has a profit per mcf of $2.00; the producer should expect a 50% ROI in a year if the well averages an INCREMENTAL 308 Mcfd/ 112,500 Mcf ($150,000÷$10,000=15 x 20.5= 308 Mcfd).

CASE STUDIES

HORIZONTAL EOR/REMEDIATION

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nanoActiv® Treatment Overview

Well Preparation

- Operator should ensure tubing, casing and surface equipment tested to sufficient pressure for recommended surface treating pressures.
- If paraffin or asphaltene deposition is known, pre-treat wellbore with a chemical drip or by covering the perforations with lease condensate, mutual solvent, BTEX (benzene, toluene, ethylbenzene or xylene) or other solvent. If requested, Nitro-Lift can provide recommendations.
- After solvent treatment, pump wellbore at least 48 hours to recover treatment, fines or debris.
- Acid treatments are NOT recommended immediately before a nanoActiv® treatment.

nanoActiv® Treatment

- A nanoActiv® treatment is a rock matrix treatment and will not exceed fracturing pressure.

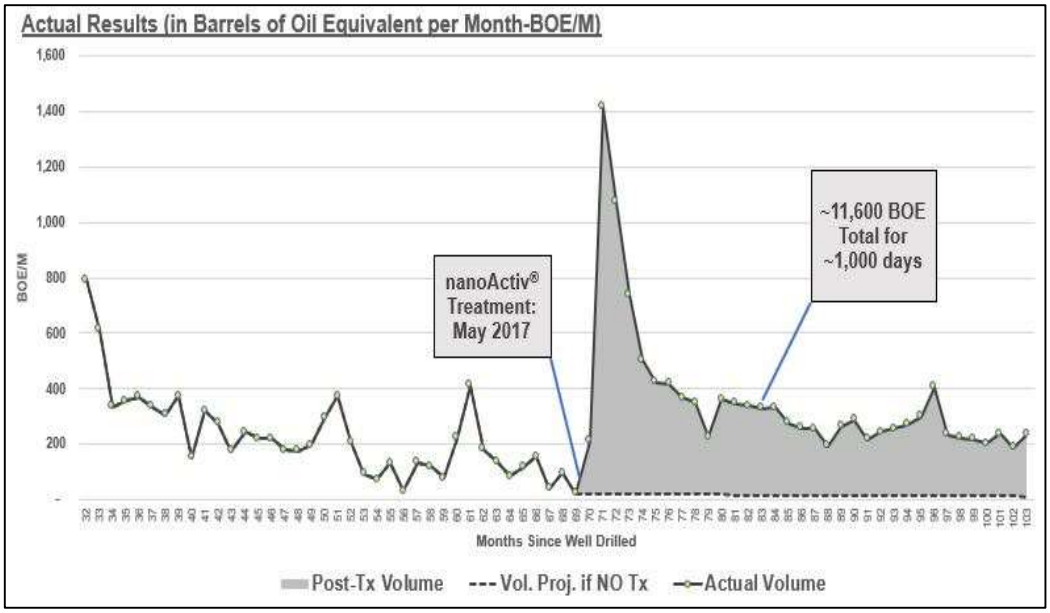
Key Takeaways

- **Nano Quantity**- Using greater volumes of nanoActiv® is the greatest factor to treatment success.
- **Gas**- The use of gas is crucial to displacing the nanoparticles further into the formation.
  - Should NOT impact spec.
- **Shut-in/Soak Time**- The length of soak time is still being tested. A minimum two-day soak is required. There have been no negative effects from shutting in a well for more than 2 days. There is not enough data to determine if a longer soak time further improves the effect of the nano.
- **Success Determinates**- Low recovery factor, existing pressure, well age

CASE STUDY: BUDA 1

nanoActiv® Treatment Overview

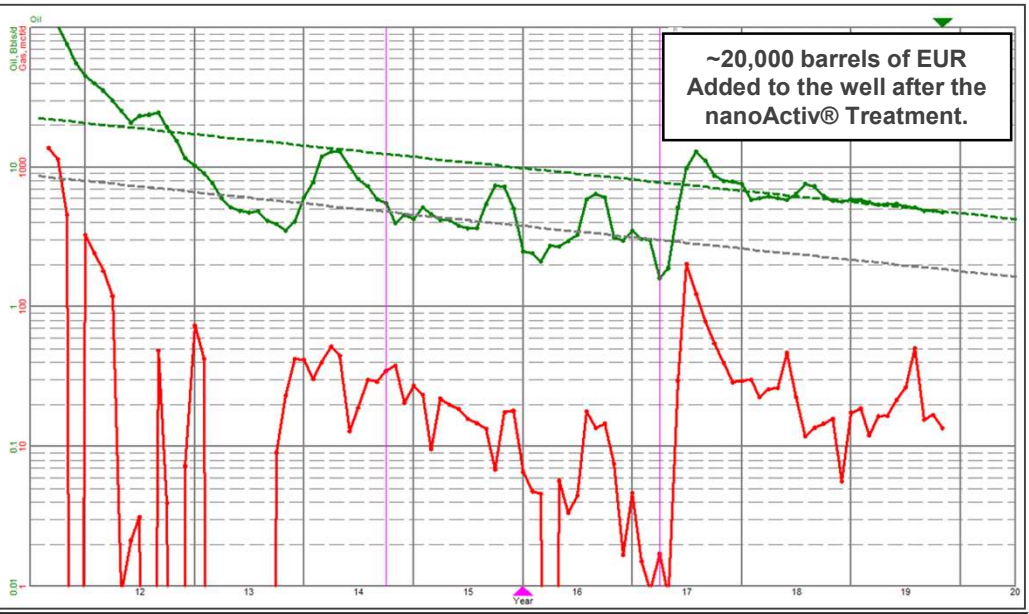
- The BUDA 1 well was an early Enhanced Oil Recovery (EOR) case study performed in 2017 during the research and development phase. The well was drilled in 2011 with an initial production rate of 140 Bopd of oil and 1,400 Mcfd of gas. By 2017, 30 days prior to treatment, the well had fallen to an average of 2 Bopd and 30 Mcfd.
- Post-treatment, the well increased oil production to 11 Bopd for 150 days.
- ~1,000 days post-treatment, the to-date incremental recovered volume is approximately 11,600 BOE.
- Treatment payback for the operator was approximately 270 days.
- Treated with 60 barrels of nanoActiv® blend and 1,600,000 of Nitrogen.



Treatment Observations

- Treatment quantity of nanoparticles has a directly impact
- Long-term effects display mechanical properties of the nano particles.
- Study the gas-to-nano ratio, along with existing pressure in the well.
- Study effects using varying gas types: nitrogen, carbon dioxide, methane, and ethane.

Third-Party Reservoir Analysis Co. used ARIES to perform a two-year post-treatment review. Conclusion, to date, there remains ~24,000 barrels of estimated ultimate recoverable oil (EUR). Had the treatment not been performed, there would be a ~4,000-barrel EUR.



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CASE STUDY: ARKOMA 1&2 TREATMENT #1

Well History

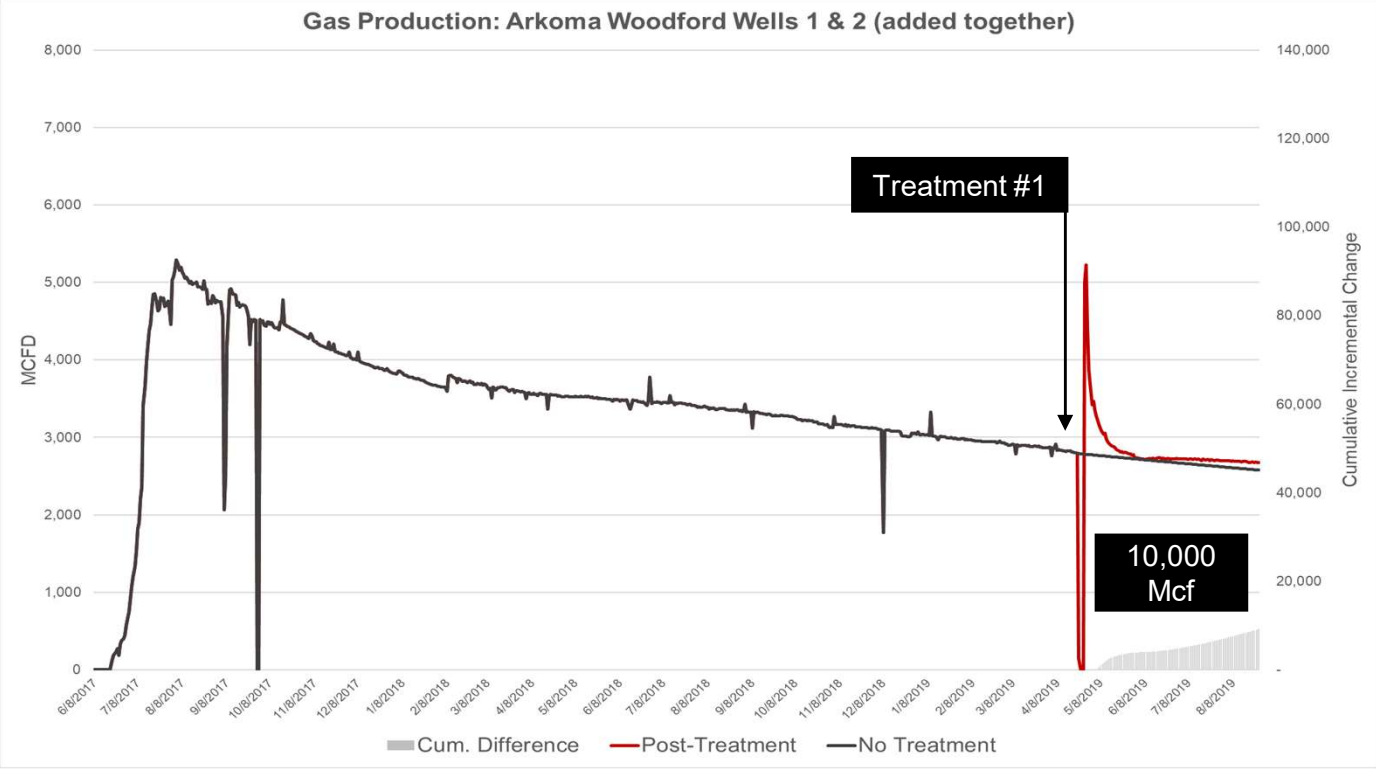
- "Arkoma Well 1", a horizontal well drilled in the Arkoma Basin/Woodford Formation (Oklahoma), was drilled in June of 2017 with a vertical depth (TVD) of 6,500 feet and lateral length of 6,000 feet in the Woodford formation. Prior to treatment, the well was producing 1,276 Mcfd and 6 Bpd, while the untreated offset well was producing 1,517 Mcfd and 8 Bpd.

nanoActiv® EOR Treatment

- On April 25, 2019 "Arkoma Well 1" was treated with 167 barrels of nanoActiv® blend and 5,250,000 standard cubic feet of nitrogen (190 tons), which took approximately 55 hours to pump with shifts of 3 men rotating every 12 hours.
- The initial site set up, safety meeting, safety check/test, were completed in 4 hours. An offset well is located approximately ten feet from "Arkoma Well 1". Within 30 minutes of beginning the treatment, the pressure of the offset well began to increase indicating the two wells were communicating, therefore the offset well was shut-in for the remainder of the treatment. Once the treatment was complete, both wells were shut-in for more than 48 hours and reopened.
- The increase in Arkoma Well 1 is not expected to be as strong due to communication with the offset.

5/1/2019-8/25/2019 Treatment #1 Observations

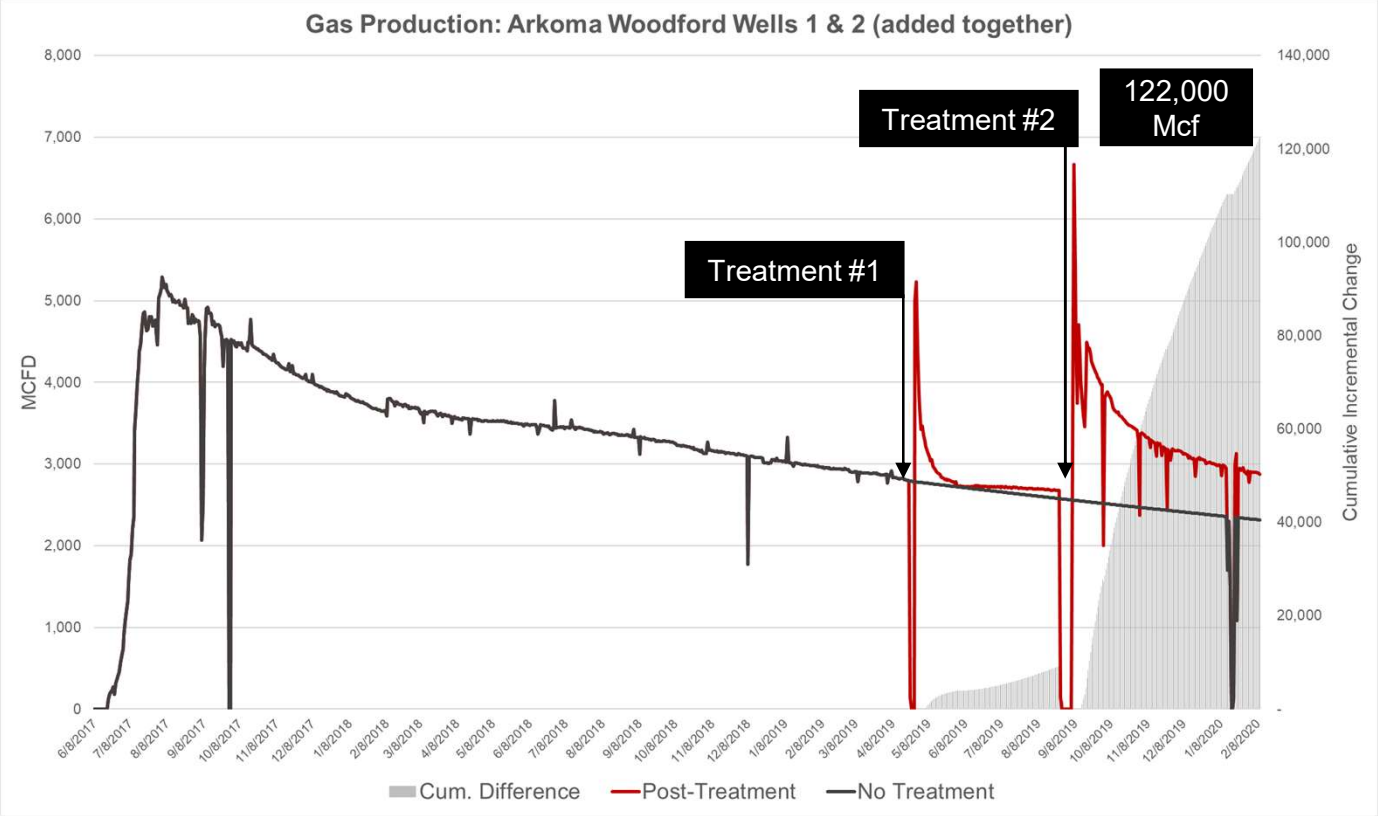
The decline curve flattened out, adding an incremental **~10,000 Mcf** to the production, but due to the communication the increase in production we were hoping for did not occur. Prior to treatment, the 30-day rolling daily decline of the two wells was .063% daily or 23% annualized. During the 4-month post-treatment, period the 30-day rolling daily decline rate improved to .031%.



CASE STUDY: ARKOMA 1&2 TREATMENT #2

nanoActiv® EOR Treatment #2

- On August 26, 2019 “Arkoma Well 2”, the offset to “Arkoma Well 1”, was treated with 333 barrels of nanoActiv® blend and 10,000,000 standard cubic feet of nitrogen, double the original treatment for Well 1. Both wells were shut in for a minimum of 72 hours.



	Treatment 1	Treatment 2	Current FoamTreatment
Volume of Nano in Barrels	167	333	600
Volume of Gas in scf	5,625,000	10,000,000	1,500,000

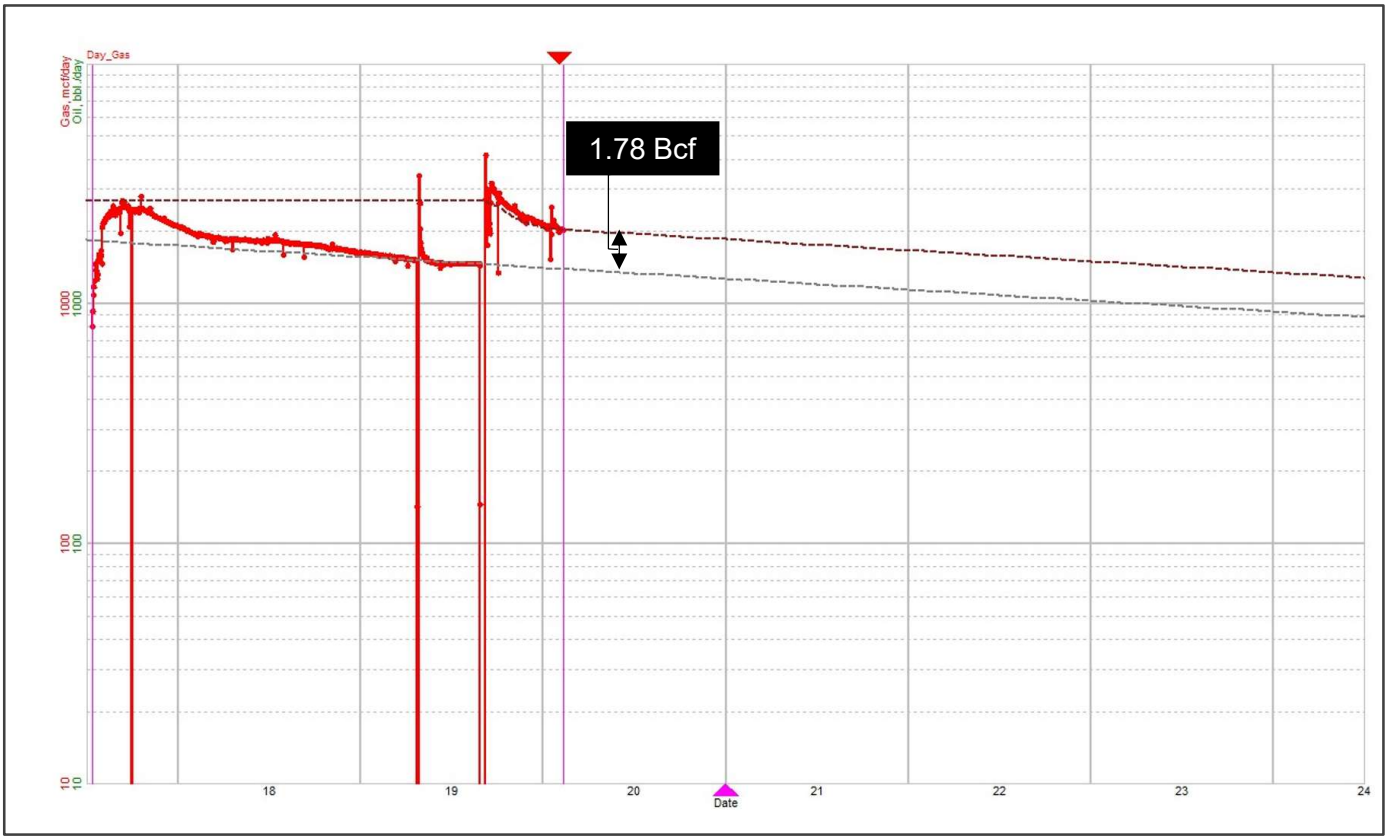
8/26/2019-2/10/2020 Treatment #2 Observations

- The treatment added an incremental **~122,000 Mcf** to production in ~180 days.
- **The producer informed Nitro-Lift, based on their economics the treatment paid for itself in less than 90 days.**
- Larger nanoActiv® volume treatment increased production exponentially.

CASE STUDY: ARKOMA 1&2

Third-Party Analysis

- February 15,2020 Nitro-Lift had an independent reservoir engineer run Aries on the post-treatment results. The report yielded: **1.78 Bcf EUR of incremental gas was added to the well with a PV-10 of ~$2.0MM**. The report estimated that the treatment paid back in 3 months.



Key Takeaways

- The first treatment solidified the observation that a greater concentration of nano particles needs to be used. **Treatment 1: 167 Barrels vs. Treatment 2: 333 Barrels**
- The gas-to-nano fluid ratio needs to be studied. We may be over displacing the fluid with too much gas.
- Communication between wells is critical in treatment dosage. If a well begins to communicate during treatment, the operator needs to be prepared to treat the communicating well also.
- Target a 90-day to 360-day payback, depending on price deck conditions.
- Experiment with coil tubing and using diverters.

CASE STUDY: ARKOMA MAYES 1

Well History

- "Arkoma Mayes 1", a horizontal well drilled in the Arkoma Basin/Woodford Formation (Oklahoma), was completed in June of 2018 with a vertical depth (TVD) of 6,500 feet and lateral length of 6,000 feet in the Mayes formation. Prior to treatment, the well was producing 1,678 Mcfd and 1 Bpd.

nanoActiv® EOR Treatment

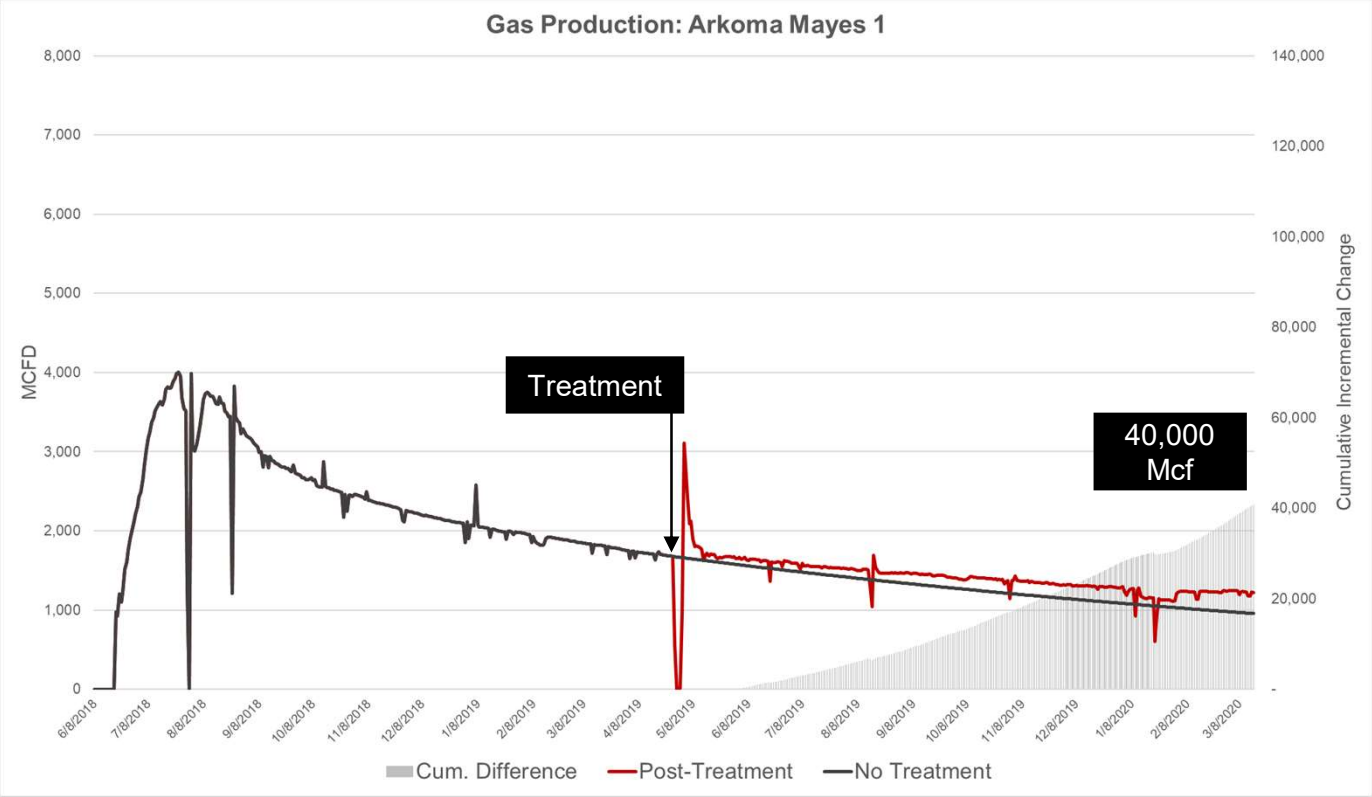
- On May 1, 2019 "Arkoma Mayes 1" was treated with 167 barrels of nanoActiv® blend and 5,250,000 standard cubic feet of nitrogen (190 tons), which took approximately 55 hours.
- An offset well is located approximately ten feet from "Arkoma Mayes 1". Within 3 hours of beginning the treatment, the pressure of the offset well began to increase indicating the two wells were communicating. The offset wellbore is in the Woodford formation. There offset well was shut-in for the remainder of the treatment. Once the treatment was complete, both wells were shut-in for more than 48 hours and reopened.
- The increase in "Arkoma Mayes 1" is not expected to be as strong due to communication with the offset.

5/1/2019-3/01/2020 Treatment Observations

The decline curve / well head production improved by an average of 130 Mcfd, adding an incremental **~40,000 Mcf** to the production. The payback on the well is anticipated to be ~One Year based on the producer's economics.

Key Takeaways:

- Study the gas-to-nano ratio. As of 3/20/20, consider treating with nanofoam to increase the amount of nano particles by using 600 barrels of nano and 1.5MM scf of nitrogen or field gas.
- Treat the offset



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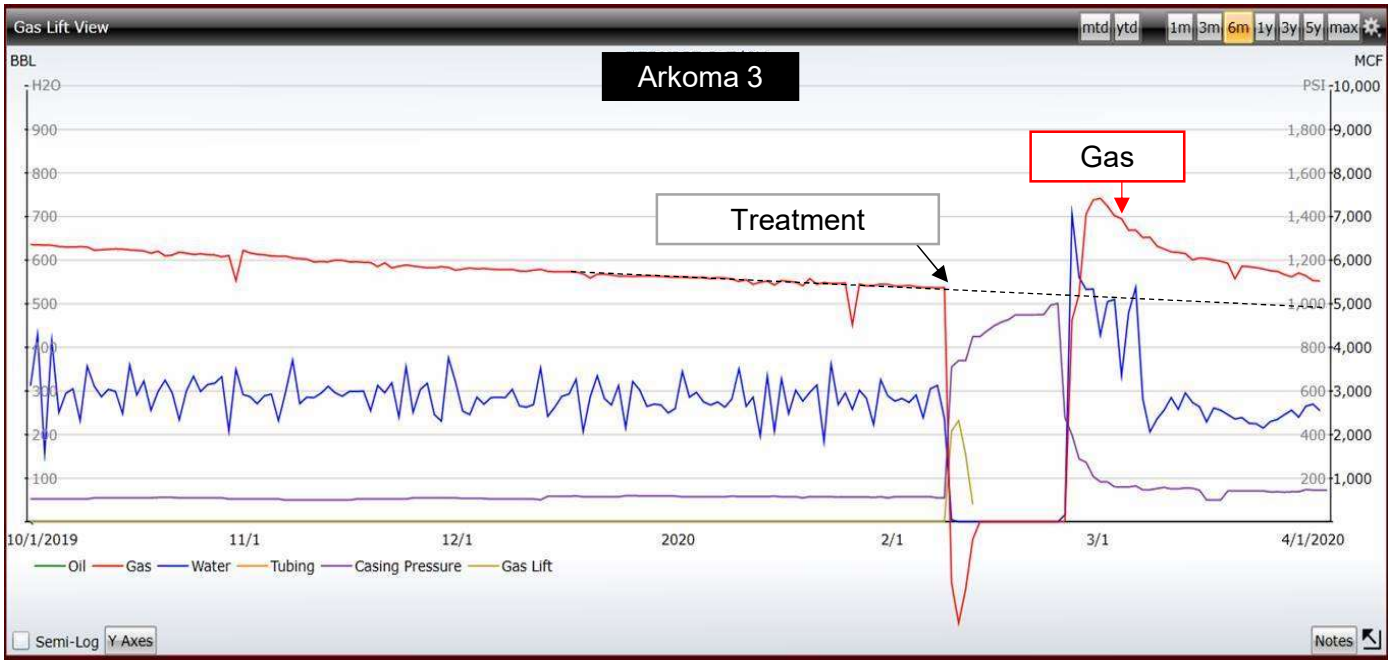
nanoActiv® Treatment Overview

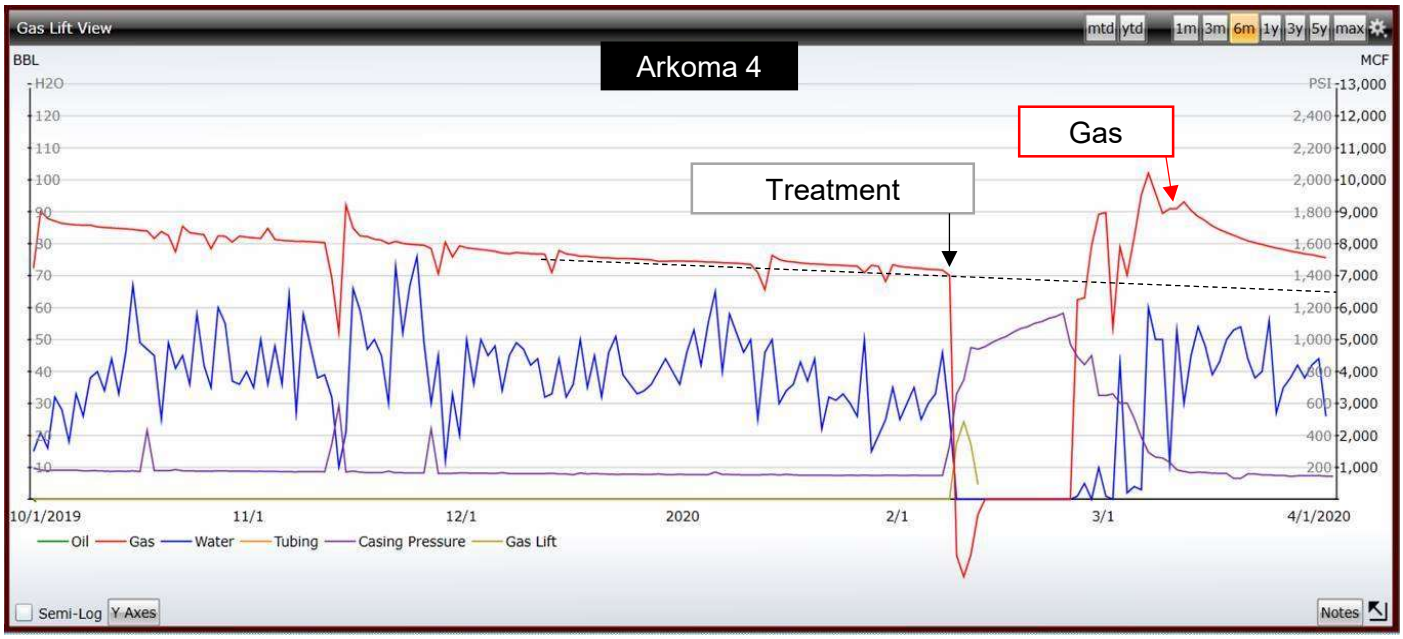
- "Arkoma Wells 3-5", are horizontal wells drilled in the Arkoma Basin, Woodford formation. The three wells are within a close proximity of the fourth well that was set to be completed. Using the producer's field gas, a treatment was designed to protect the production in the existing wells. The producer opted to use field gas along with nanoActiv®, rather than a nanoActiv®/water combination. The treatment was originally designed to hold pressure in each of the wells, during the new well completion.
- Arkoma 3 – 5 were initially treated as a Frac Hit Mitigation treatment. The state regulatory agency required the producer to delay the completion of the new well, therefore the producer opened Arkoma 3-5 after being shut-in for ~2 weeks.

Treatment Details

- On February 4, 2020 Arkoma Wells 3-5 were each treated using a combination treatment. Each of the 3 wells were treated using the same amount of gas and nano particles. The producer supplied the field gas and compressor for the treatment. Initially, the well was loaded with 500,000 scf of methane followed by pumping 7 stages alternating between nanoActiv® and field gas. After completing 7 stages, a high-density nanofoam was pumped into the reservoir, followed by one final injection of field gas.
- Each of the wells were treated with 167 barrels of nanoActiv® blend, 1,228 barrels of high density nanofoam, and 5,000,000 standard cubic feet of methane. Each of the wells took approximately 48 hours to pump.
- Upon opening the wells, the producer choked back each of the wells for 2 weeks.
- Using field gas helped to reduce the cost of the treatment, thereby improving the economics of the treatment.

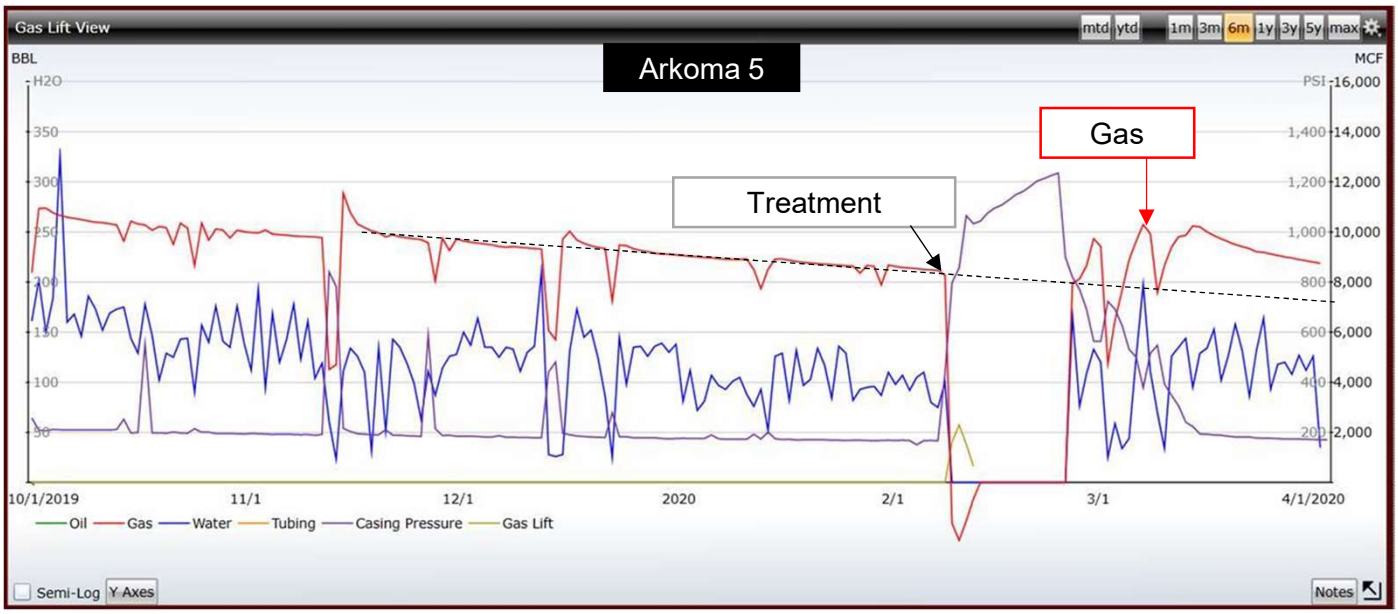


CASE STUDY: ARKOMA WOODFORD 3-5



Short-term Post Treatment Observations

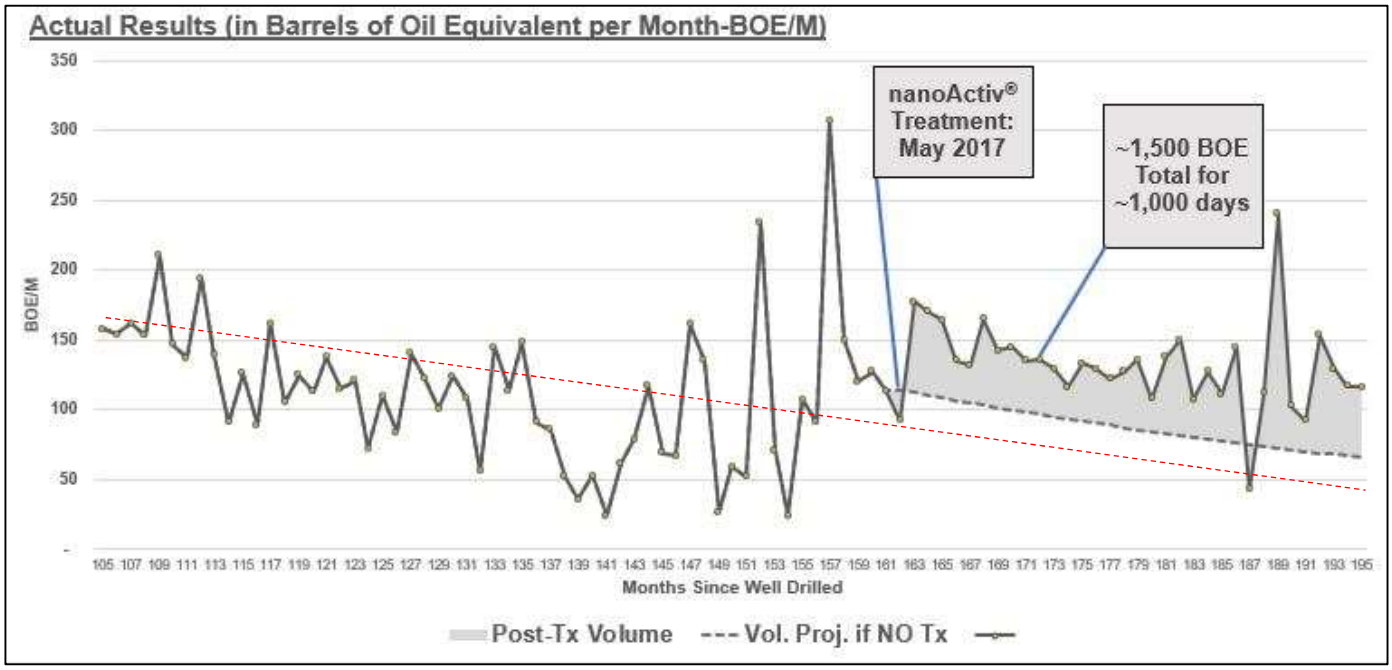
- Arkoma 3 is producing an additional **~800** Mcfd more gas prior to treatment.
- Arkoma 4 is producing an additional **~1,500** Mcfd more gas prior to treatment.
  - After reopening the well shut-ins occurred due to the midstream operator.
- Arkoma 5 is producing an additional **~1,500** Mcfd more gas prior to treatment.
  - After reopening the well shut-ins occurred due to the midstream operator.
- Producer has requested another treatment for Arkoma Basin and quotes for an additional basin. Progress has been delayed due to COVID-19 shutdown.

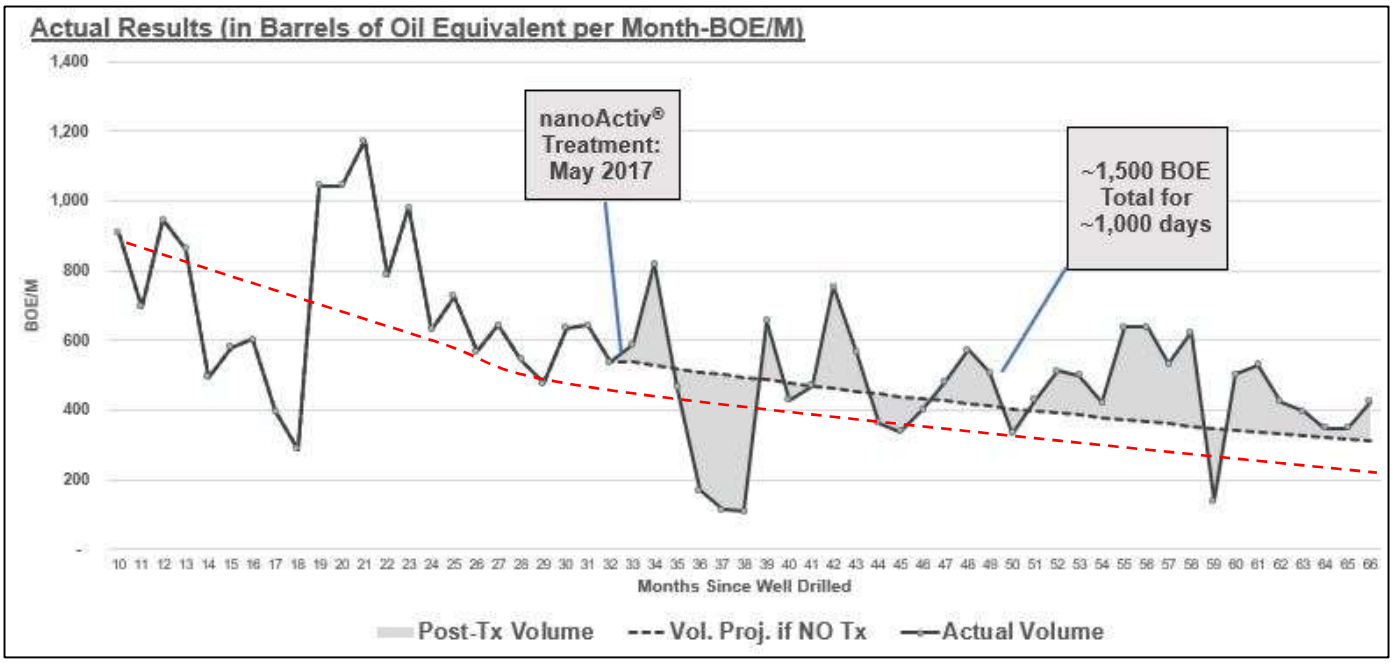


CASE STUDY: AUSTIN CHALK 1&2

nanoActiv Treatment Overview

- "Austin Chalk wells 1&2" were Enhanced Oil Recovery case studies treated during the research and development phase.
- The wells were treated with 30 barrels of nanoActiv® blend and 1,000,000 scf of Nitrogen each.
- Well 1 was producing 3 Bopd pre-treatment. Post-treatment, the production increased to an average of 6 Bopd for 90 days. As of today, the well is producing 4 Bopd.
- Well 2 was producing 7 Bopd and 70 Mcfd pre-treatment. Post-treatment, oil production remained at 7 Bopd but gas production increased to an average of 90 Mcfd for 90 days. As of today, the well is producing 5 Bopd and 40 Mcfd.
- We believe the lower dosage of nanoActiv® used compared to the Buda well affected the sustainability of the long-term incremental production.





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CASE STUDIES

FRAC HIT MITIGATION

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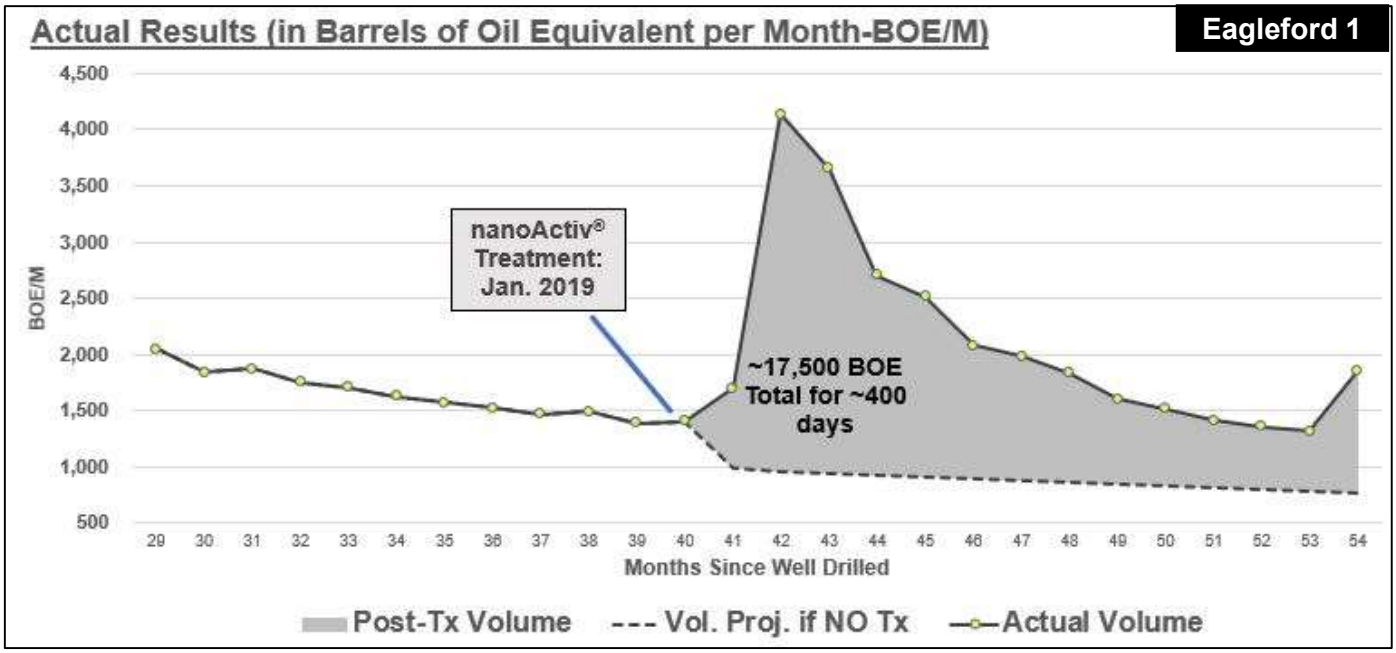
CASE STUDY: EAGLEFORD FRAC HITS 1-3

nanoActiv® Treatment Overview

- "Eagleford Wells 1-3", are horizontal wells drilled in the Eagleford formation in DeWitt County, Texas.
- On January 15th, 2019, Eagleford 1 was treated with 5,000 barrels of water, injected with 120 barrels of nanoActiv® blend as smaller-volume pills throughout the initial pre-load. The treatment soaked for approximately 2½ weeks during the infill well work to allow the nanoparticles to diffuse throughout the reservoir and alter the wettability of the formation to create more favorable fluid-flow conditions.
- On May 15th, 2019, Wells 2 and 3 were treated. Well 2 was treated similarly to Well 1 with 120 barrels of nanoActiv® , whereas Well 3 was treated with ½ the dosage, 60 barrels of nanoActiv® blend. Like Well 1, wells 2 and 3 had a soak time of 2 ½ weeks while infill well work was being completed.

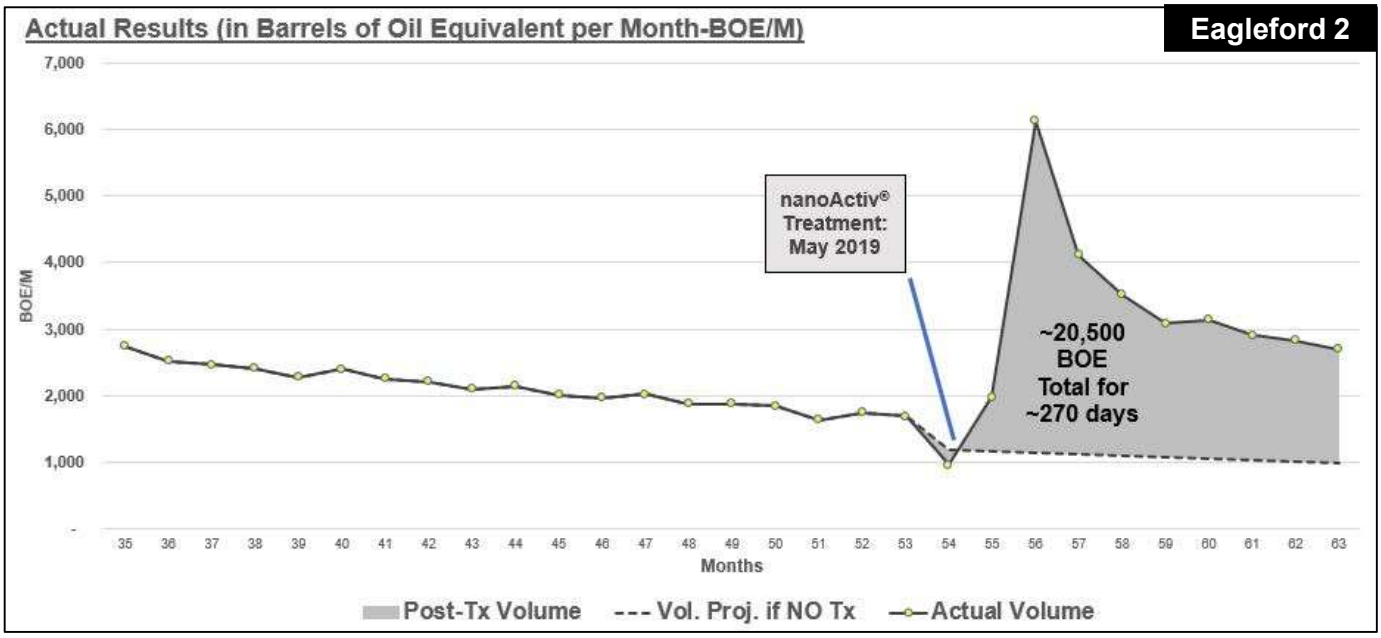
Post-Treatment Observations.

- **Prior to using nanoActiv®, the operator of the three Eagleford case studies stated, on average well production was returning to only 65% Bopd. However, after treatment with nanoActiv® preloads, the producer is seeing initial wells surpass previous production rates.**



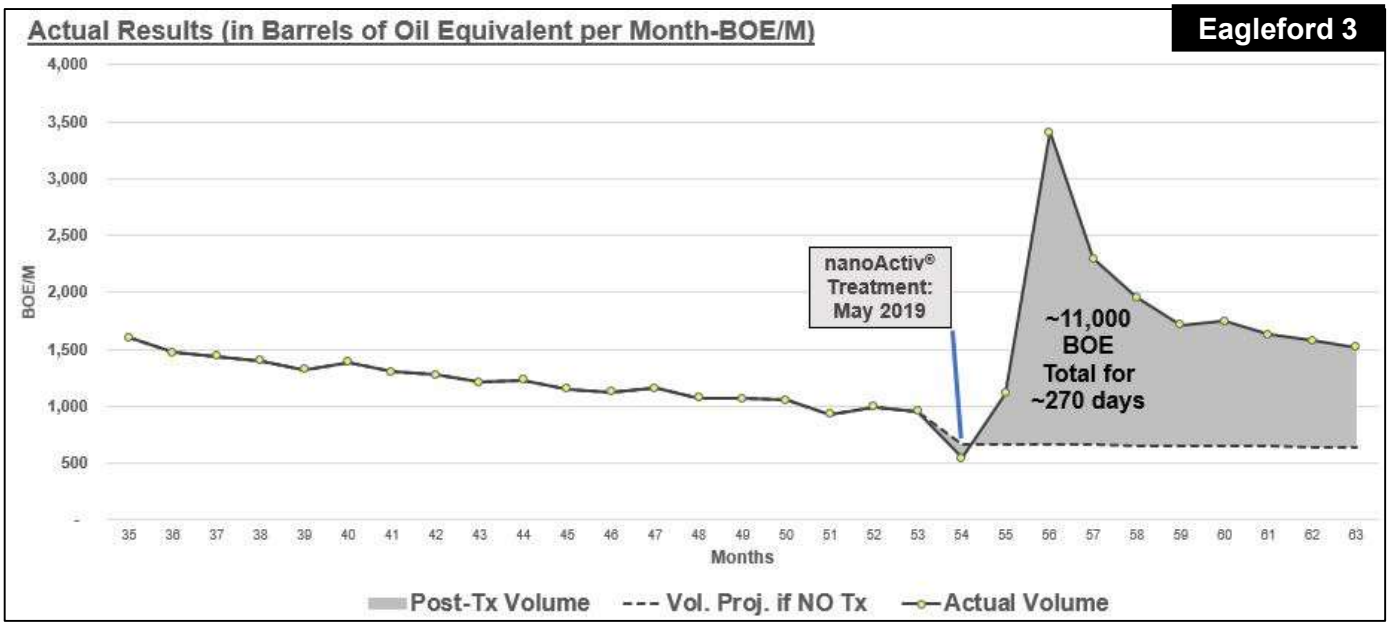
- Post-treatment, a significant increase in production was observed, as the well increased oil production to 100 Bopd for 150 days, and the pre-load treatment surpassed the previous production rate for more than six months.
- ~400 days post-treatment, Well 1 is producing 60 Bopd.
- Based on the producer's economics, treatment payback for the operator was ~30 days.
- To-date, Well 1's incremental recovered volume is approximately **17,500 BOE**

CASE STUDY: EAGLEFORD FRAC HITS 1-3



Post Treatment Observations

- ***For wells 2 and 3, the pre-load treatment has continued to surpass the previous production rate over eight months post-treatment.***
- To-date, Well 2 has produced an additional **~20,500** more BOE prior to treatment.
- Based on the producer's economics, treatment payback for the operator was ~60 days.
- To-date, Well 3 has produced an additional **~11,000** more BOE prior to treatment.
- Based on the producer's economics, treatment payback for the operator was ~90 days.

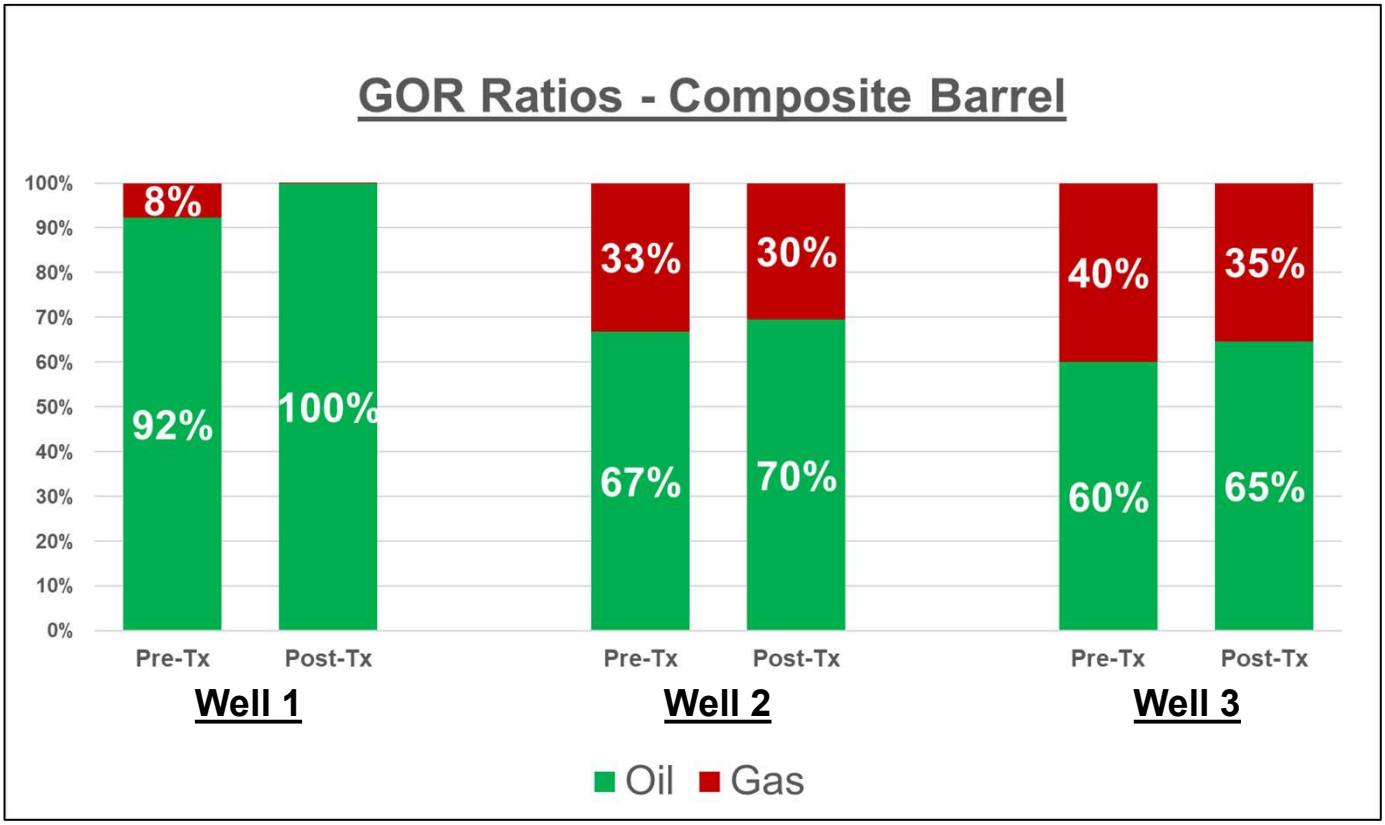


CASE STUDY: EAGLEFORD FRAC HITS 1-3

Key Conclusions

- The effects of frac hits can be significantly mitigated by using the patent-pending process of combining a re-pressurization fluid with nanoActiv®. The technologies work to reduce interfacial tension and modify wettability—allowing more hydrocarbons to be mobilized in a re-pressurized environment created by using large volumes of injected fluid.
- **Consequently, not only are fracture interactions mitigated in the parent well, more hydrocarbons are also produced.**

	Pre-Treatment	Post-Treatment				
	30-Day Daily Avg.	150-Day Daily Avg.	Days Since Treatment	Current Production	Treatment Payback	Incremental BOE
Eagleford Well 1	50 BOE/D	100 BOE/D	400	60 BOE/D	30 Days	17,500
Eagleford Well 2	40 BOE/D	120 BOE/D	280	90 BOE/D	60 Days	20,500
Eagleford Well 3	20 BOE/D	70 BOE/D	280	50 BOE/D	90 Days	11,000



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CASE STUDY: WOLFCAMP FRAC HITS 1-4

nanoActiv® Treatment Overview

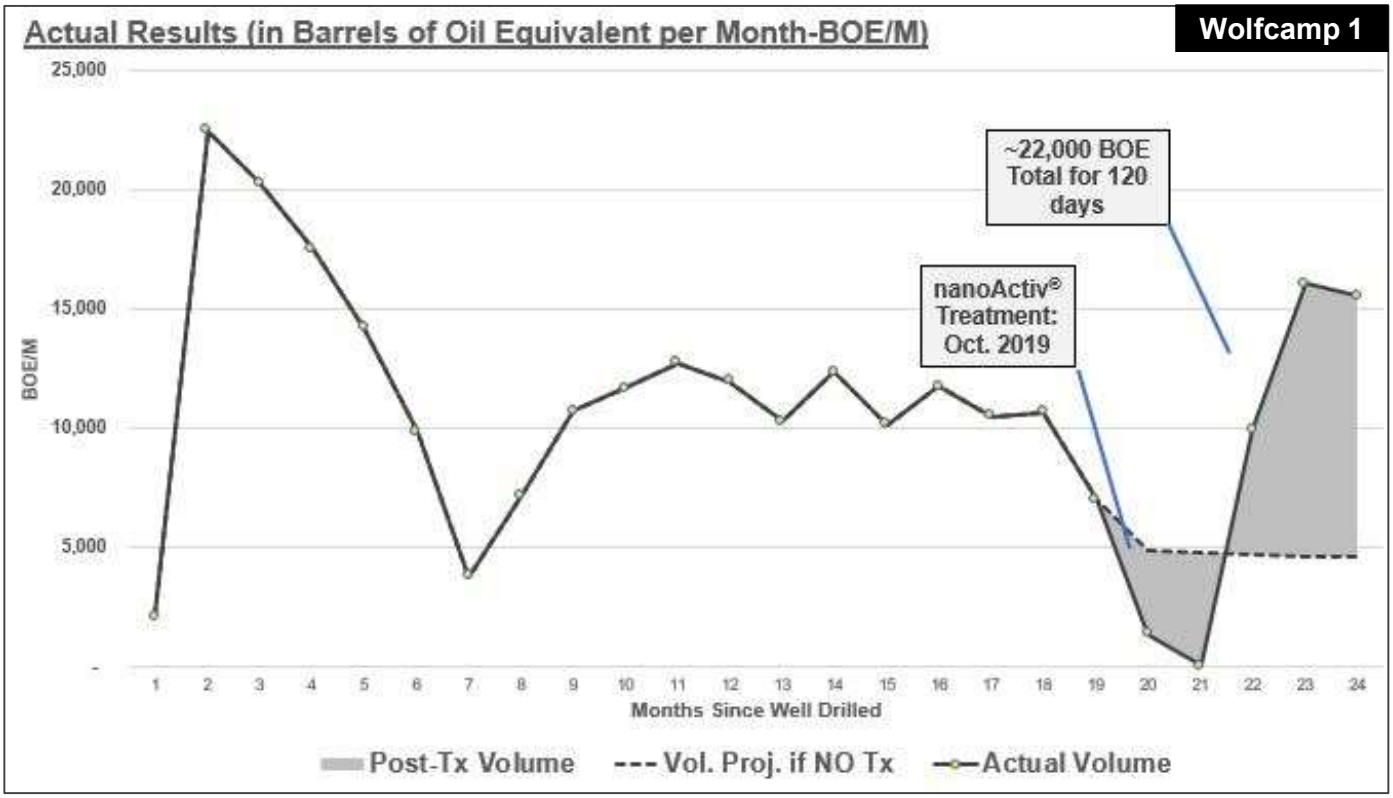
- "Wolfcamp Wells 1-4", are horizontal wells drilled in the Permian Basin, targeting the Wolfcamp formation in February 2018.
- On October 1st, 2019, Wells 1-4 were treated with 5,000 barrels of nanoActiv® blend per well.
- ~60 days prior to treatment, the wells were shut-in.

Post-Treatment Observations.

- **Post-treatment, a significant increase in production was observed, as each of the wells are now producing an average of 160% more BOPD.**
- **Based on the producer's economics, treatment payback for each of the wells was ~90 days.**

Post Treatment Results – 90 Days

- To-date, **Well 1** has produced an incremental **~19,200** more BOE prior to treatment.
- To-date, **Well 2** has produced an incremental **~24,200** more BOE prior to treatment.
- To-date, **Well 3** has produced an incremental **~30,200** more BOE prior to treatment.
- To-date, **Well 4** has produced an incremental **~28,500** more BOE prior to treatment.



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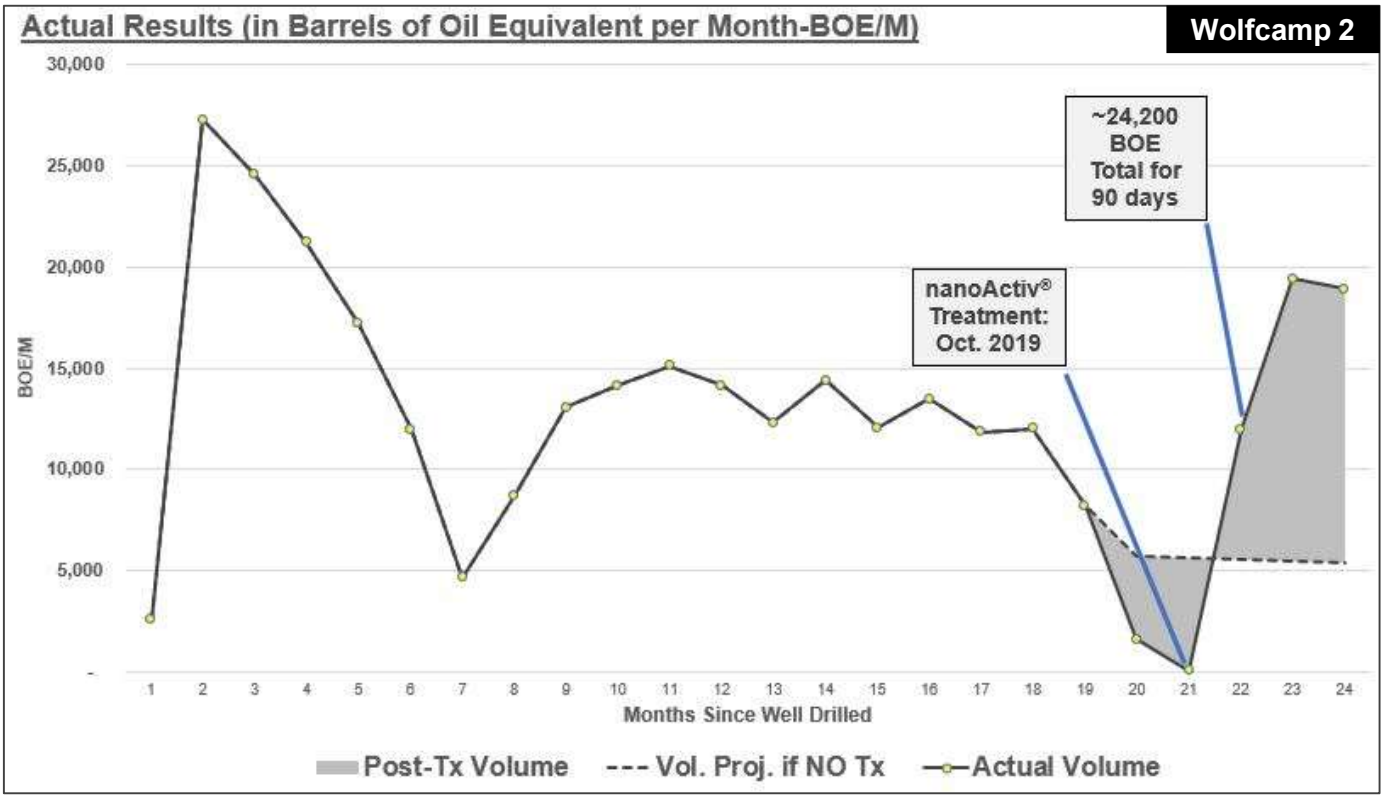
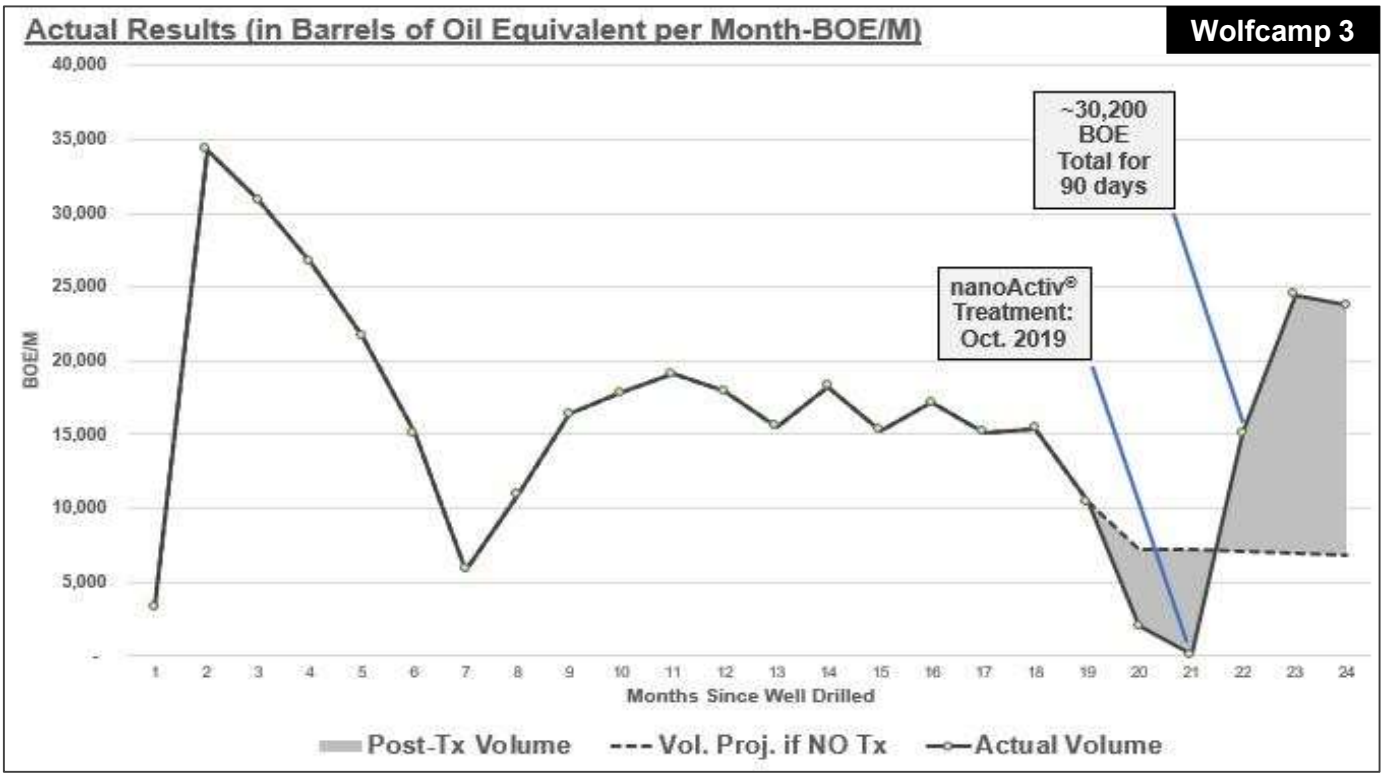
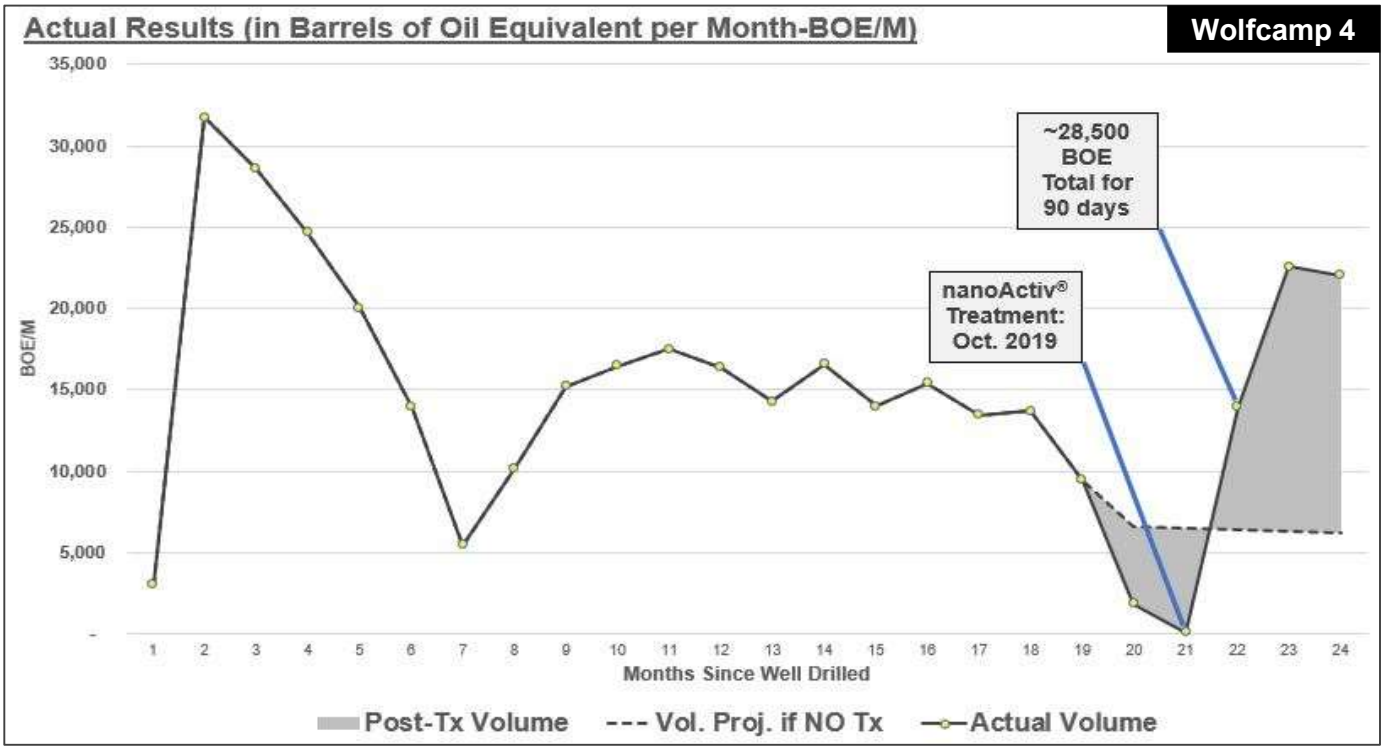
CASE STUDY: WOLFCAMP FRAC HITS 1-4



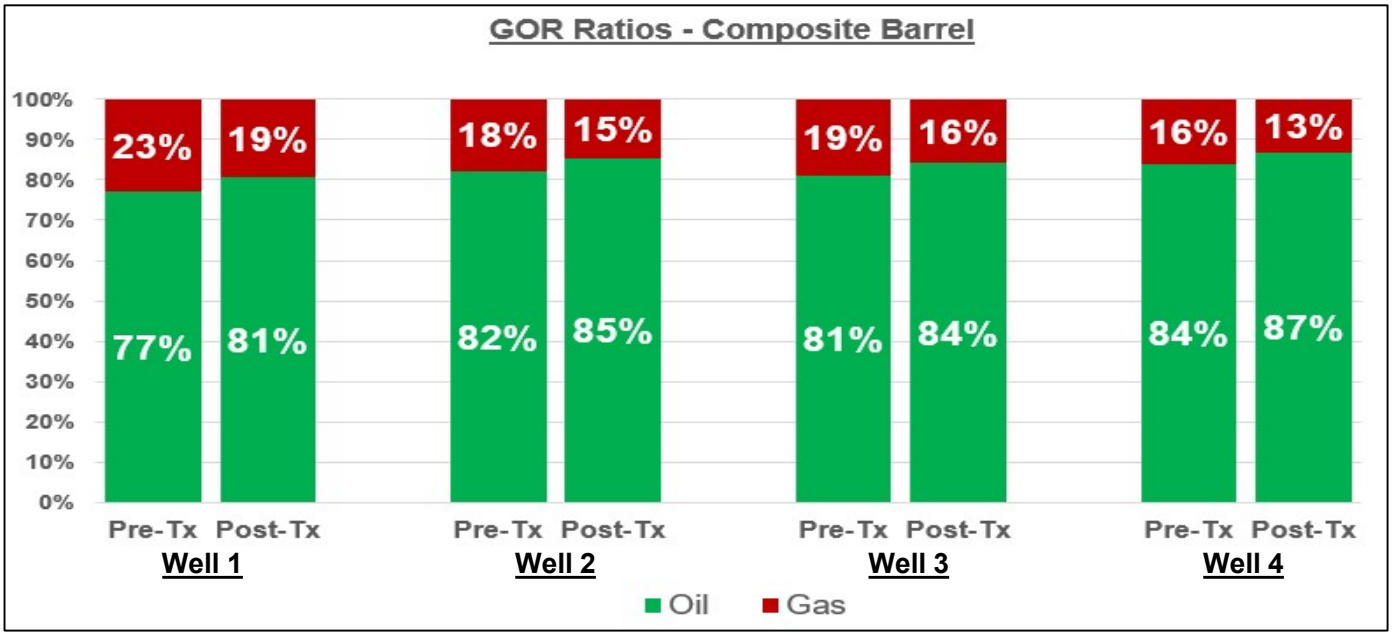


CASE STUDY: WOLFCAMP FRAC HITS 1-4

nanoActiv®



	Pre-Treatment	Post-Treatment				
	30-Day Daily Avg.	90-Day Daily Avg.	Days Since Treatment	Current Production	Treatment Payback	Incremental BOE
Wolfcamp Well 1	230 BOE/D	460 BOE/D	90	520 BOE/D	90 Days	19,200
Wolfcamp Well 2	270 BOE/D	560 BOE/D	90	630 BOE/D	90 Days	24,200
Wolfcamp Well 3	350 BOE/D	700 BOE/D	90	800 BOE/D	90 Days	30,200
Wolfcamp Well 4	320 BOE/D	650 BOE/D	90	730 BOE/D	90 Days	28,500



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CASE STUDIES

VERTICAL EOR/REMEDIATION

nanoActiv® by Nissan Chemical

Nitro-Lift® TECHNOLOGIES LLC

The Exclusive Distributor of nanoActiv®.

MESSER Gases for Life

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nanoActiv® Vertical Treatment Overview

Well Preparation

- Operator should ensure tubing, casing and surface equipment tested to sufficient pressure for recommended surface treating pressures.
- If paraffin or asphaltene deposition is known, pre-treat wellbore with a chemical drip or by covering the perforations with lease condensate, mutual solvent, BTEX (benzene, toluene, ethylbenzene or xylene) or other solvent. If requested, Nitro-Lift can provide recommendations.
- After solvent treatment, pump wellbore at least 24 hours to recover treatment, fines or debris.
- Acid treatments are NOT recommended immediately before a nanoActiv® treatment.
- Nitro-Lift can pump down casing, tubing or annulus.
- Workover rig not required.

nanoActiv® Treatment

- A nanoActiv® treatment is a rock matrix treatment and will not exceed fracturing pressure.

Summary

Well Name	State	Well Type	Pre-Treatment Volume	Post Treatment Volume	Age of Treatment	nanoActiv EFT	nanoActiv HRT	Nitrogen Used	Notes
Fayettville 1	AR	Vertical	10 Mcfd	109.8 Mcfd	493	No	Yes	Yes	
Fayettville 2	AR	Vertical	10 Mcfd	75 Mcfd	492	No	Yes	Yes	
Fayettville 3	AR	Vertical	10 Mcfd	46 Mcfd	491	No	Yes	Yes	
SCOOP 1	OK	Vertical	0.8 Bpd	3 Bpd	66	Yes	No	No	
Barnett 1	TX	Vertical	1 Bpd	2.5 Bpd	65	Yes	No	No	
Barnett 2	TX	Vertical	1 Bpd	2.5 Bpd	65	Yes	No	No	
Granite Wash 1	TX	Vertical	0 Bpd	0 Bpd	57	Yes	No	No	Should have used N2 to displace treatment further into the formation
STACK 1	OK	Vertical	40 Mcfd	40 Mcfd	52	Yes	No	No	Should have used N2 to displace treatment further into the formation
Wolfcamp 1	TX	Vertical	3 Bpd	5 Bpd	144	Yes	Yes	Yes	Over displaced treatment by pushing too much N2. Offsets were responding.
Wolfcamp 2	TX	Vertical	3 Bpd	10 Bpd	23	Yes	No	No	
Barnett 3	TX	Vertical	3 Bpd	TBD Bpd	0	Yes	Yes	Yes	
Flipppin Lime 1	TX	Vertical	2 Bpd	TBD Bpd	2	Yes	No	No	
Flipppin Lime 2	TX	Vertical	2 Bpd	TBD Bpd	2	Yes	No	No	
Flipppin Lime 3	TX	Vertical	2 Bpd	TBD Bpd	2	Yes	No	No	
Flipppin Lime 4	TX	Vertical	2 Bpd	TBD Bpd	2	Yes	No	No	

Fayetteville 1,2, and 3

- In December 2018, three wells were treated at the same time. Each of the wells were dry gas wells producing ~10 Mcfd. After treatment each of the wells increased in production by more than 10x. Nitrogen was used to displace nanoActiv in the formation.
- Fayetteville well 3 began to produce water, was shutdown to be serviced by a swabbing unit.
- **More than a year post-treatment, each of the wells are producing over 300%+.**

Key Takeaways:

- Does the lighter molecule of nat. gas respond better to nanoActiv?

Barnett 1 and 2

- Barnett 1 and 2 were treated in February 2020. Prior to treatment the Barnett Wells 1 and 2 were both producing 1 barrels of oil per day each. The operator was considering placing this well on their Plug and Abandon (P&A) list.
- Both wells were treated with a nanoActiv remediation treatment. The well was treated with a ~500-barrel treatment pumped at a rate of 2 to 3 barrels per minute and allowed to soak for ~96 hours.
- **Both wells are producing 2.5 to 3 barrels per day, a 150% to 200% increase in production.**

SCOOP Viola Lime Well

- Prior to well treatment, the Viola Lime was producing 0 - 1 barrels of oil per day. The operator was considering placing this well on their Plug and Abandon (P&A) list.
- Feb. 1, 2020 Viola Lime was treated with a 500 bbl nanoActiv® remediation treatment at a rate of 2 - 3 BPM and shut-in for 96 hours.
- At production, paraffin was produced out of tubing.
- Production was 4 BOPD. Repairs to separator were made and well is averaging 3 BOPD.
- **300% Increase**

Paraffin

Key Takeaways

- Pretreat well for paraffin.
- Use nitrogen for greater displacement in reservoir.

Granite Wash Well 1

- Prior to treatment the Granite Wash Well1 was producing 0 barrels of oil per day. The operator was considering placing this well on their Plug and Abandon (P&A) list.
- February 15, 2020 Granite Wash Well 1 was treated with a nanoActiv® remediation treatment. The well was treated with a ~500-barrel treatment pumped at a rate of 2 to 3 barrels per minute and allowed to soak for ~ 2 Weeks.
- **The well temporarily began to produce 3.5 barrels per day but reverted to 0 Bpd.**

Key Takeaways:

- **Treat wells already producing a minimum of 1 to 2 Bpd.**
- **Use nitrogen to push nano into the formation.**

STACK Chester Well 1

- Pre-treatment: Chester formation producing 40 – 50 Mcfd for 2 years on plunger lift.
- Treatment: Treated with 35 bbl. nanoActiv® EFT at a rate of 2 to 3 barrels per minute and allowed to soak for 78 hrs.
- Post-treatment: Chester formation producing 100 Mcfd for 2 weeks, a 100% increase, then reverted to 40 to 50 Mcfd.

Key Takeaway: Use nitrogen to push nano into the formation.

Wolfcamp 1

- Wolfcamp 1 was treated in November 2019. The well was treated by alternating nanoActiv® and nitrogen. The well began pressure up, indicating zones were blocked.
- Post-treatment: the production stayed flat at pre-treatment levels of 50 Bopd and 570 Mcfd.
- Shortly after, the offset wells began to respond.

Key takeaways:

- Too much nitrogen was used, displacing nanoActiv® into the offset wells.

Additional Info

FAQs
About us

nanoActiv® by Nissan Chemical

Nitro-Lift® Technologies LLC

The Exclusive Distributor of nanoActiv®.

MESSER Gases for Life

RecoverMoreOil.com

FAQs

What applications can nanoActiv® be used for?
Answer: Frac Hit Mitigation, EOR/IOR, Remediation, and New Completions

How much do treatments cost?
Frac-Hit Mitigation- $100,000 to $500,000+
EOR/IOR Horizontals- $100,000 to $250,000+
EOR/IOR Verticals- $10,000 to $50,000
New Completions- $200,000 to $500,000+

How long does it take to treat a well?
It varies, but generally 6 to 12 hours for vertical wells and 24 to 60 hours for horizontal wells.

How long does the treatment last?
We're unsure, but we have seen lasting positive impacts (12% to 500%+), on wells treated 2 years ago during the initial R&D phase.

Are offset wells affected?
They can be depending on the connectivity of the wells. Customers are encouraged to watch the volumes of the wells on the same pad or surrounding the treated well(s).

What is a nanoparticle?
A nanoActiv® nanoparticle is a surface treated silicon dioxide particle.

Can nanoActiv® help to treat formation (skin) damage?
Yes

Can nanoActiv® work on a waterflood?
Yes

How long do you have to shut the well in treated?
36 hours to 14-days.

Can nanoActiv ® withstand high salinity?
Yes, but we will need to do a compatibility test beyond 200,000 TDS.

What do I need to do to determine if my wells are good candidates?
Go to RecoverMoreOil.com and fill out the "Well Data Submission" form.
Be prepared to collect and send oil and water samples to be tested.

Do you have any case studies I can review?
Yes, go to RecoverMoreOil.com or ask a sales representative.

Does nanoActiv® change the wettability of the rock surface?
YES

What additional costs will I incur?
None, unless your well has a packer. The packer will have to be unseated.

What are the success criteria?

- Mechanically Sound
- Existing pressure
- **Consistently** producing a minimum of 2Bpd or 50Mcfd

Post Treatment Expectations

- Horizontal EOR/Remediations: 12.5% to 40% increase on wells less than 24 months old. Older depleted wells may see increases above 40% to 100%+.
- Vertical EOR/Remediations: 50% to 500%+ increase.
- Frac Hit Mitigations: At a minimum, the wells treated should return to original production, but we have seen every case thus far increase above pretreatment production volumes.

Nissan Chemical America Corporation

Product Developer

- Multibillion-dollar international chemical company founded in Japan in 1887.
- Developer and producer of **nanoActiv® HRT, EFT, and more to come.**
- Initial focus of nanoActiv® was in the initial production of the well. After recognizing the potential of nanoActiv®, Nissan sought a partnership with Messer to help develop an enhanced oil recovery method using the nanoActiv® particles.
- Signed Nitro-Lift to the exclusive distributorship of nanoActiv® for the U.S. in the fall of 2019.

Nitro-Lift® TECHNOLOGIES LLC

Exclusive U.S. Distributor, & Service Provider:

- Vertically integrated energy service company specializing in:
  - Upstream: Onshore and Offshore Hydrocarbon Recovery
  - Midstream: Pipeline and G&P Services
  - Downstream: Refinery and Industrial Services
- An industry leader in nanotechnology applications for Recovery Factor Solutions for existing wells.
- Oil and Gas Fabrication

MESSER Gases for Life

Process Developer & Gas Provider

- Multibillion-dollar international industrial gas company (Acquired Linde in 2019).
- Assisted in the development of deploying **nanoActiv®** using nitrogen, carbon dioxide, water, and methane.
- Messer had worked with Nitro-Lift for years on several projects. Messer quickly recognized the value of utilizing Nitro-Lift's "down-hole" and nitrogen expertise and brought Nitro-Lift under a nondisclosure agreement in 2016.

nanoActiv horizontal treatments typically range from $125,000 to $250,000 per treatment and vertical treatments range from $10,000 to $25,000.

Drill and Complete (D&C)

When compared to drilling and completing one horizontal well, a producer can treat between 20 and 80 wells with nanoActiv treatments and achieve a 90 to 365-day payback.

- Cost $6.0MM to $10.0MM+ Versus $125,000 to $250,000
  - The cost of one nanoActiv well is ~2% of the cost of drilling one well.
  - nanoActiv
- D&C has 18-month to 24-month+ paybacks versus 90-day to 365-day paybacks.
- Production needed to achieve payback can be seen on the next page.

Wet Gas Economic Comparison

	Drill & Complete	nanoActiv Treatment
Cost:	$10,000,000	$150,000
Production Volume (Mcf):	3,000,000	120,000
Current Cost per Mcf:	**$3.33**	**$1.25**
Age of Well / Treatment (Days):	900	180
Payback (Days):	*Undisclosed*	<90

Refrac

When compared to a drilling and completing one well, a producer can treat between 8 and 24 wells with nanoActiv treatments and achieve a 180 to 365- day payback.

- Refracs cost $2.0MM to $3.0MM
- 12-month to 24-month+ paybacks
- Production needed to achieve payback can be seen on the next page.

Total volume needed to achieve payback

Profit per Barrel of Oil or Mcf	Drill and Complete		Refrac		nanoActiv Horizontal		nanoActiv Vertical	
	$6,000,000	$10,000,000	$2,000,000	$3,000,000	$125,000	$250,000	$10,000	$25,000
	BO or Mcf	BO or Mcf	BO or Mcf	BO or Mcf	BO or Mcf	BO or Mcf	BO or Mcf	BO or Mcf
$25.00	240,000	400,000	80,000	120,000	5,000	10,000	400	1,000
$20.00	300,000	500,000	100,000	150,000	6,250	12,500	500	1,250
$15.00	400,000	666,667	133,333	200,000	8,333	16,667	667	1,667
$10.00	600,000	1,000,000	200,000	300,000	12,500	25,000	1,000	2,500
$5.00	1,200,000	2,000,000	400,000	600,000	25,000	50,000	2,000	5,000
$3.00	2,000,000	3,333,333	666,667	1,000,000	41,667	83,333	3,333	8,333
$2.00	3,000,000	5,000,000	1,000,000	1,500,000	62,500	125,000	5,000	12,500
$1.50	4,000,000	6,666,667	1,333,333	2,000,000	83,333	166,667	6,667	16,667
$1.00	6,000,000	10,000,000	2,000,000	3,000,000	125,000	250,000	10,000	25,000

Daily Volume needed to achieve payback in 1 Year

Profit per Barrel of Oil or Mcf	Drill and Complete		Refrac		nanoActiv Horizontal		nanoActiv Vertical	
	$6,000,000	$10,000,000	$2,000,000	$3,000,000	$125,000	$250,000	$10,000	$25,000
	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd
$25.00	658	1,096	219	329	14	27	1	3
$20.00	822	1,370	274	411	17	34	1	3
$15.00	1,096	1,826	365	548	23	46	2	5
$10.00	1,644	2,740	548	822	34	68	3	7
$5.00	3,288	5,479	1,096	1,644	68	137	5	14
$3.00	5,479	9,132	1,826	2,740	114	228	9	23
$2.00	8,219	13,699	2,740	4,110	171	342	14	34
$1.50	10,959	18,265	3,653	5,479	228	457	18	46
$1.00	16,438	27,397	5,479	8,219	342	685	27	68

Daily Volume needed to achieve payback in 180 Days

Profit per Barrel of Oil or Mcf	Drill and Complete		Refrac		nanoActiv Horizontal		nanoActiv Vertical	
	$6,000,000	$10,000,000	$2,000,000	$3,000,000	$125,000	$250,000	$10,000	$25,000
	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd	Bopd or Mcfd
$25.00	1,333	2,222	444	667	28	56	2	6
$20.00	1,667	2,778	556	833	35	69	3	7
$15.00	2,222	3,704	741	1,111	46	93	4	9
$10.00	3,333	5,556	1,111	1,667	69	139	6	14
$5.00	6,667	11,111	2,222	3,333	139	278	11	28
$3.00	11,111	18,519	3,704	5,556	231	463	19	46
$2.00	16,667	27,778	5,556	8,333	347	694	28	69
$1.50	22,222	37,037	7,407	11,111	463	926	37	93
$1.00	33,333	55,556	11,111	16,667	694	1,389	56	139

- Simple example of calculating "Profit per Barrel of Oil or Mcf"

Crude Price						
Price (WTI)		$	50.00	$	35.00	$ 25.00
(less) Differential		$	(4.00)	$	(4.00)	$ (4.00)
Basin Price		$	46.00	$	31.00	$ 21.00
(less) Royalty	*20%*	$	(9.20)	$	(6.20)	$ (4.20)
(less) Severance Tax- Varies by State	*7%*	$	(3.22)	$	(2.17)	$ (1.47)
(less) Lease Operating Expense-LOE		$	(7.50)	$	(7.50)	$ (7.50)
Profit Price to Producer		$	26.08	$	15.13	$ 7.83

Natural Gas Price						
Price (NYMEX)		$	2.00	$	1.75	$ 1.60
(less) Differential/Basis		$	(0.20)	$	(0.20)	$ (0.20)
Basin Price		$	1.80	$	1.55	$ 1.40
(less) Royalty	*20%*	$	(0.36)	$	(0.31)	$ (0.28)
(less) Severance Tax- Varies by State	*7%*	$	(0.13)	$	(0.11)	$ (0.10)
(less) Gathering and Transportation		$	(0.85)	$	(0.85)	$ (0.85)
Profit Price to Producer		$	0.46	$	0.28	$ 0.17

Natural Gas Liquids Price- C3+						
Price- C3+ Composite (Mont Belvieu)		$	0.75	$	0.60	$ 0.50
(less) Differential/Basis		$	-	$	-	$ -
Basin Price		$	0.75	$	0.60	$ 0.50
(less) Royalty	*20%*	$	(0.15)	$	(0.12)	$ (0.10)
(less) Severance Tax- Varies by State	*7%*	$	(0.05)	$	(0.04)	$ (0.04)
(less) Transporation and Fractionation		$	(0.12)	$	(0.12)	$ (0.12)
Profit Price to Producer		$	0.43	$	0.32	$ 0.25