

CONTROLLED RELEASE DBNPA GRANULES FOR OIL AND GAS FRACTURING FLUIDS



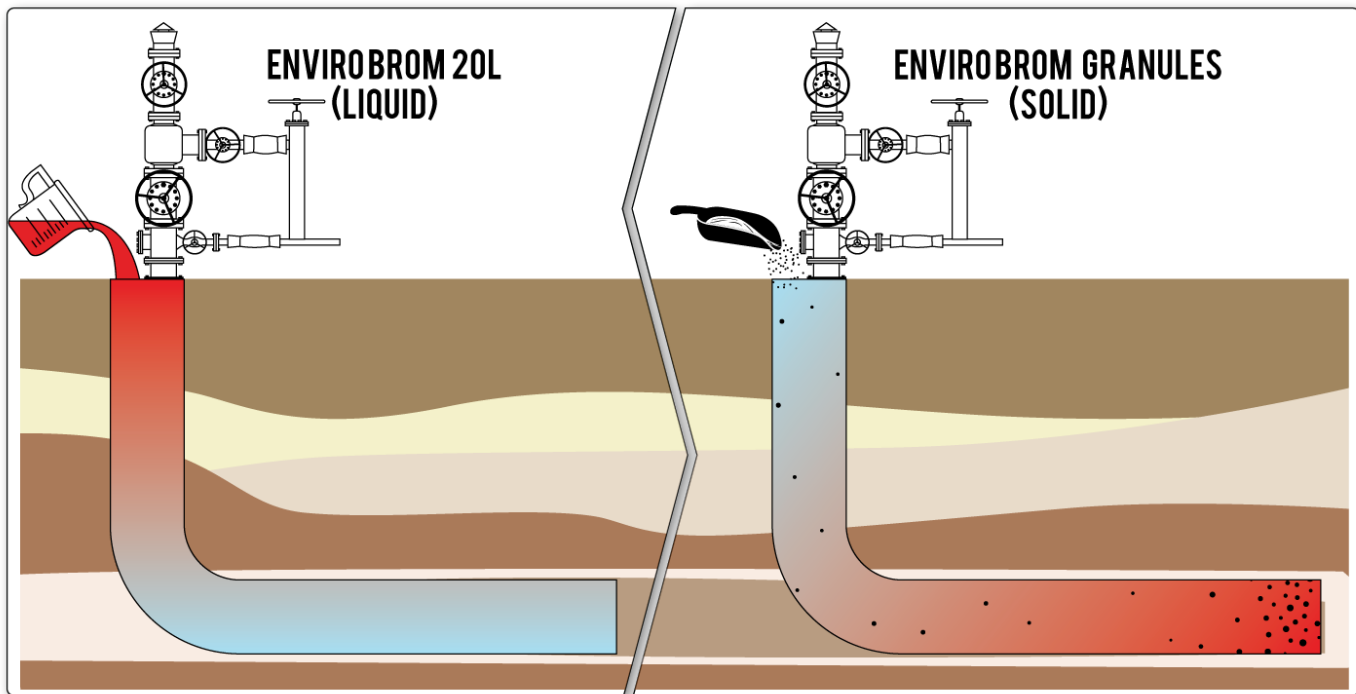
Jon Howarth, Ph.D **Todd Shaver, B.S.**
Enviro Tech Chemical Services, Inc

PROBLEM

LIQUID DBNPA STARTS
DEGRADING AS SOON
AS IT'S IN SOLUTION

SOLUTION

A SOLID BIOCIDIDE THAT
LASTS TO PROVIDE
TARGETED DELIVERY AT
THE POINT OF USE



With liquid DBNPA, the region of highest concentration is near the surface.

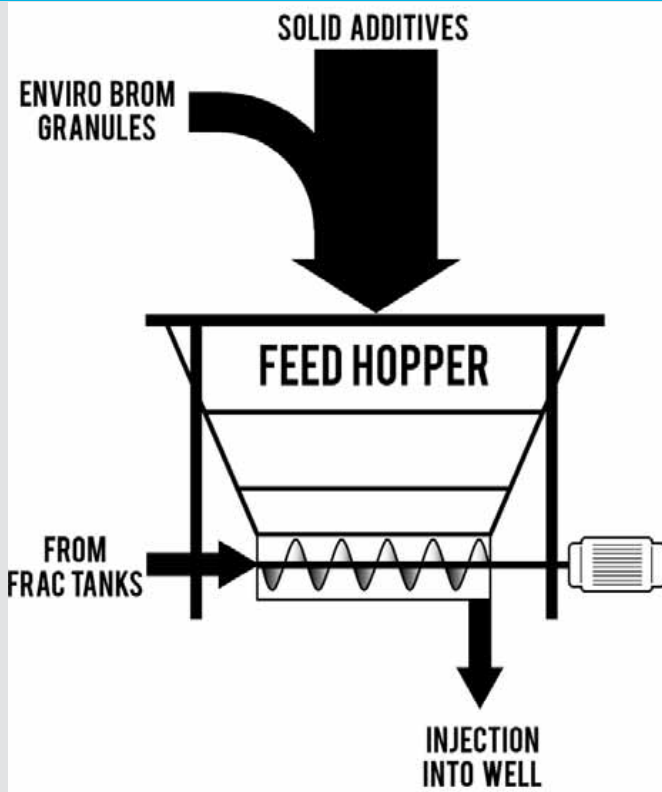
By switching to granules, more of the active ingredient is delivered to the target zone.

ORDINARY DBNPA VS. ENVIROBROM® GRANULES

- Unformulated DBNPA dissolves too quickly for this approach to be practical
- However, with Enviro Tech's slow-dissolving technology Enviro Brom granules last for up to 24 hours



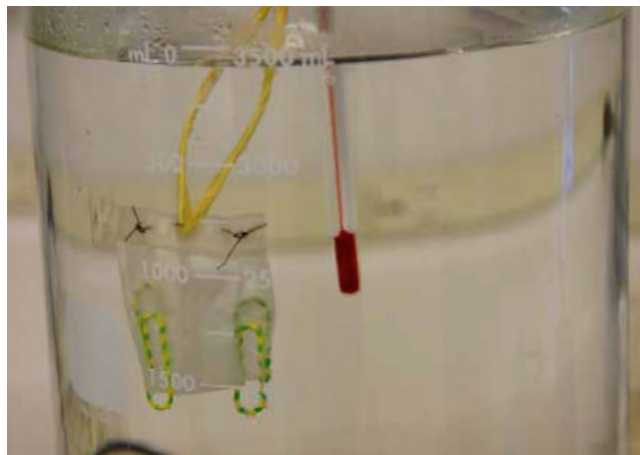
- EnviroBrom® granules are -8/+20 mesh
- Dust-free for safe use
- Any size granule can be made and used; larger ones will dissolve slower



ANTICIPATED METHOD OF USE

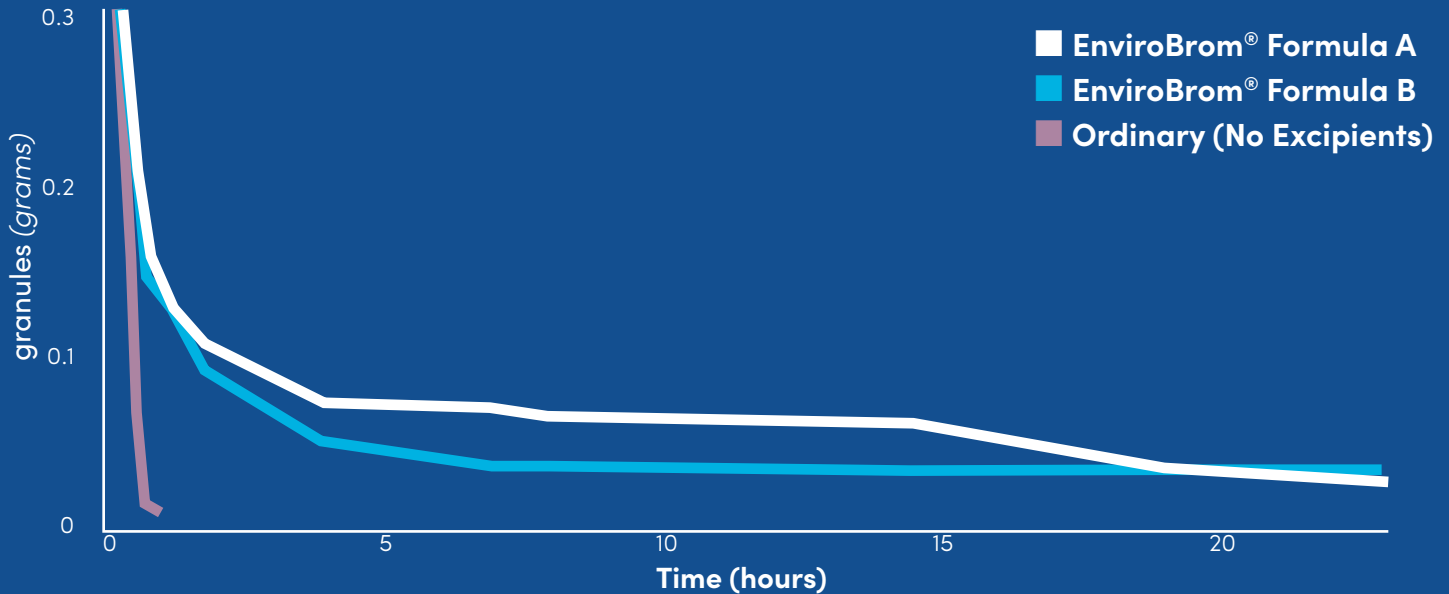
- No process modification required
- Granules can be manually added directly to the feed hopper with other solid additives (i.e., 1 lb of granules in a water soluble bag)

SIMULATION OF GRANULES EXPOSED TO AQUEOUS ENVIRONMENT IN FORMATION



- Granules were immobilized in a temperature controlled bath (120° F)
- Both DBNPA residual and granule mass were tracked over time

MASS OF GRANULES OVER TIME FOR ORDINARY DBNPA VS. ENVIROBROM® GRANULES



CONCLUSIONS

- With Enviro Tech’s proprietary, biocide granules last for up to 24 hours, allowing for targeted biocide delivery
- Even once the granules are dissolved there will be residual biocide in solution until it has decomposed