

Frack Water Treatment Technologies

Ecosphere Technologies Inc., based in Stuart, Fla., is one of the dominant providers of water treatment for the shale-gas industry, according to Lux Research, a technology research and consulting firm. The company's technology avoids the use of chemicals typically employed to treat wastewater.

Ecosphere's process forces dirty water through pipes where ozone breaks down contaminants with the help of sound waves, electrically charged particles and changes in pressure. No waste is created in the process, because while the technology renders contaminants harmless it doesn't filter anything out.

WaterTectonics Inc., based in Everett, Wash. uses a process called electric coagulation, in which an electric charge forces contaminant particles into clumps that can be removed after they either rise to the surface of the water or sink to the bottom. The process avoids the use of chemicals, but it does produce waste that has to be disposed of.

Altela Inc., based in Albuquerque, N.M., earned a spot on Artemis Project's 2011 list of the 50 most innovative water-technology companies in the U.S. Its technology mimics rainmaking. Wastewater is heated to the point of evaporation, which produces clean water in the form of vapor, leaving contaminant particles behind. The vapor is then condensed back into liquid form.

The basic process, called thermal distillation, isn't new, but Altela has found a way to make it more efficient, by capturing the heat generated by condensation and using it for evaporation. Ned Godshall, the company's chief executive, says Altela's method uses a third of the energy typically required for conventional thermal distillation.

Cleaning Up?

A rundown of selected technologies for treating contaminated fracking water

BAG FILTERS

How they work: Sand and grit is trapped in a filter, while the rest of the water comes through.

Pro: Cheap.

Con: Leaves all the other pollutants in the water.

CHEMICAL PRECIPITATION

How it works: Chemicals are added into the water; the chemicals precipitate metals into insoluble form, and the metals are then removed.

Pros: Widely used; relatively cheap.

Cons: Does not remove salt; generates a sludge requiring disposal.

ELECTRIC COAGULATION

How it works: Charged particles attach to metals and separate them from water; the pollutants are then skimmed off.

Pro: Avoids the use of chemicals for treating water.

Cons: Does not remove salt; not widely used for large scale applications; generates a sludge requiring disposal.

COMBINATION

Several methods such as adding ozone, ultrasound, electricity and pressure

How it works: Oxygen molecules change the composition of pollutants, making them less harmful.

Pros: Almost no waste is created; destroys bacteria.

Con: Does not remove salt.

DISTILLATION

How it works: Uses heat to evaporate fresh water.

Pro: Only method that removes salts from waters with high concentration of solids.

Con: More expensive as it has high energy input and may require pretreatment to remove metals.

MEMBRANE FILTRATION

How it works: A nano filter is used to remove metals.

Pros: Can effectively reduce metals and to some degree salts; requires little or no pre-treatment.

Con: Filter media may need to be replaced frequently, raising costs.

Sources: WSJ reporting; David Yoxtheimer, Penn State Marcellus Center for Outreach and Research