Report on EU Horizon 2020 funded FracRisk fact-finding visit to Eureka Resources Standing Stone Gas Well wastewater treatment Facility

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Background

On the 5th April 2016 a small group of researchers from Europe, funded by the EU Horizon 2020 project FracRisk (http://www.fracrisk.eu/) visited the Eureka Resources Standing Stone Gas Well wastewater treatment Facility, located outside the town of Williamsport in Pennsylvania. The visit was organised by the Marcellus Center for Outreach and Research (MCOR) at Penn State University (http://www.marcellus.psu.edu/)

Eureka Resources commenced construction of the plant in March 2013 to serve producers involved in Marcellus Shale gas developments in the region. This facility is one of three that Eureka Resources have now built in the area around Williamsport, which are conveniently located for developers and producers. The facility accepts waters from any oil and gas activity and was designed especially for fracking waters, and these arrive continuously throughout the day by truck (Fig. 1).

Prior Disposal Routes

Before this facility was built, all wastewater from Pennsylvania was trucked for deep injection in Ohio as there are few wastewater disposal wells in the state (~10 in total, and not all are currently permitted for shale gas wastewaters). Subsurface injection of wastewaters is linked to significant earthquakes in Ohio that have also caused undesirable surface impacts. Whilst wastewater injection is still allowed by US licensing rules the cost per tonne of trucking and injecting wastewater is more than the clean-up service offered by the Eureka Resources plant visitor, mostly through saving the cost of trucking the wastewater over long the long distance to Ohio.

Fig. 1 - Truck offloading waste water in the administration bay of the Eureka Resources Standing Stone Gas Well facility

Plant Clean-up Facilities

This Standing Stone facility provides pre-treatment of raw wastewater from well sites and provides treated distilled water for immediate drilling and production reuse (Fig. 2). The first phase of the plant, completed in 2014, offered pre-treatment and crystallizer technology, which processes wastewater into distilled water and 100 tons/day commercial grade sodium chloride, sold for road salt or swimming pools. The second phase of construction (initially planned for 2014, but not yet in operation when we visited) will allow for brine crystallization to generate commercial grade calcium chloride. Additional separation equipment installed allows the crystallisation of barium chloride (sent to landfill) and magnesium chloride. The addition of membrane biological reactor (reverse osmosis) treatment capability was in place when we visited and this allows direct discharge and unrestricted reuse of treated water. According to the Plant Manager who hosted our visit, Joe Hatton, this is the only plant in the US that is licensed to dispose of treated water into a river.

Fig. 2 - The FracRisk project party inside the Eureka Resources Standing Stone Gas Well facility

Approximately 15% of the water received is from flowback following hydraulic fracturing operations, with the rest originating from produced water from the wells once they enter the production phase (typically one month after hydraulic fracturing). The plant serves a 60 mile radius and roughly speaking some 50% of the water injected is returned either as flowback fluid or produced water. The amount of flowback water and produced water depends on the location within the Marcellus shale, and also varies greatly between different shales in the US in different basins – the Marcellus has a comparatively small percentage of flowback. This is purely empirical and no predictive science was mentioned – clearly there is an implication for sizing a clean-up plant before experience from active production has been gained.

The facility has a capacity to handle 420,000 gallons per day of wastewater for pre-treatment, and has the capacity to desalinate up to 5,000 barrels of wastewater per day using the crystallization process. The crystalliser produces approximately 500 tonnes of NaCl salt per day, which is used for road salting and industry applications (Fig. 3). At the time of visiting the plant was producing 1,000 barrels of waste for disposal from 120,000 gallons of water admitted per day. Each truck holds 4,500 gallons of wastewater and the plant can receive up to 50 trucks per day, but typically averages 35.

Fig. 3 - The salt produced from the NaCl crystalliser at the plant

Treatment Costs

Basic pre-treatment costs a minimum of $8 per barrel, with surcharges for solids, oils and low salinity waters (as less commercial salt can be produced). The full treatment process costs $26 per barrel. There is a further $35 per tonne charge for landfill sludge. The amount of material that can be landfilled is limited by the radioactivity levels (termed technically enhanced naturally occurring radioactive material – TNORM) on a monthly basis. Three landfill sites in the vicinity are licensed to accept such wastes. Every truck which enters the facility is individually tested by the onsite geochemistry laboratory (Fig. 4). Until the water is tested each load is held in separate tanks, and only mixed and administered to the plant once the treatment require for the truckload is determined.

Fig. 4 – The geochemical laboratory at the plant where wastewater is tested before treatment

Plant Construction Costs

The plant cost some $30 million to build, took two years to construct and two years to train the staff to undertake consistently reliable operations. However, as previously outlined work to incorporate calcium carbonate precipitation was still ongoing at the time of our visit. We were informed that the plant employed 30 staff (6 per shift) and was covering its costs, but would only be making strong profits once the calcium carbonate facility had been added.

Further details on this and other Eureka Resources are available here: http://eureka-resources.com/