

Case Study

*Water, The Most Overlooked Aspect of
Building an Ethanol Plant, 2006*



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You just committed to building an ethanol plant. You spent thousands to assess gas and electric availability, the cost of running extra rail spurs and even ensuring access to the county blacktop, but did you test the water? You know there is an aquifer a few hundred feet down and the county extension office said there is plenty of water, so water WAS the least of your worries.

You raised the equity, broke ground and even drilled the well. Have you tested the water to determine what impact it will have on plant performance? Not knowing the quality of the water, at the very least, can lead to some unexpected capital equipment cost. At the very worst, it can prevent the plant from operating. There are many issues that need to be addressed in the plant's discharge permit. Zero discharge does not mean no water will leave the plant. It will be necessary to either discharge to a local municipality, which becomes very cost prohibitive or to the environment, which requires a DNR permit. The quality of the water will affect the amount and type of chemicals, the amount of water and the total amount of water needed. If there are constituents in the water such as sulfates, nitrates or chlorides, you might have a problem getting a discharge permit. The basic ethanol plant has three major

demands for the water: the mash cook process, the energy center, and the cooling system. Each of these processes requires a different quality and quantity of water.

The alcohol process is the least demanding. There are only a few constituents in the water that will cause a problem in the ethanol process. High levels of sulfates or chlorides can stress the yeast out and lower yields.

The energy center consists of the boiler or the heat recovery unit, the deaerator and condensate piping. This process requires very pure water, free of contaminants, which can cause scale that shortens equipment life. Many deep water wells have high iron, manganese and calcium levels. Each of these creates its own unique set of problems. If your plan was to run the plant using soft water, you will remove the iron and manganese. In addition, if you use industrial softening as the pretreatment, you will be generating large quantities of chlorides when you regenerate the softeners. Chlorides are becoming a source of pollution that many municipalities are trying to reduce and many other local agencies that issue discharge permits are looking closely at

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too. Overfeed of chemicals to address the high iron and alkalinity could affect your ability to sell your DDG as an animal feed based on CVM / FDA limitations.

The cooling system requires the largest amount of water of all the sub systems. A typical 40 MM gpy ethanol plant has to remove between 80-100 M btu / hr. The cooling towers are designed to run at maximum efficiency. As little as a 1/64th of an inch of calcium scale will reduce heat transfer efficiency by as much as 15% in your heat exchangers and towers. This could affect your ability to produce ethanol optimum product rates. If the raw water source is very high in calcium or iron, the tower system could be forced to run at very low cycles of concentration, the amount of water needed to operate the tower will increase significantly. This will lead to a list of increased costs, such as higher electricity costs on the well pumps and higher chemical cost. If the actual cycles of concentration versus design are different enough, there could be enough additional demand to create a problem with the supply. The difference in water quality in a 40 MM gpy plant could double the amount of the water used and discharged from the plant.

Who is responsible for determining the quality of the water, the affects on the plant design and operation costs? These are questions that need to be answered early in the process. It maybe more expensive in the

beginning to run a rail spur a few extra miles or build a road the same distance, but those things can be done. Finding a different water source once you have built is a lot more difficult. If you would like a detailed checklist of water-related issues that need to be considered when looking at a particular site and a free well water analysis test kit, please contact a US Water Services Representative.

