

## Wastewater Recycling and Reuse

Water is and will continue to be a limited resource. As our population continues to grow we need to continually improve our efficiencies in water use and conservation. California has had its share of dry years, which compounds with the ever increasing demand for both ground and surface water. In studying the problem, Clark Bros. Inc. has researched techniques in conservation, distribution and recycling.

Clark Bros. Inc. has a fifty year history of helping San Joaquin Valley farming operators conserve and better use available water resources. In recent years we have strengthened our skills and techniques in developing more advanced treatment and recycling systems.

In 1997, we expanded our efforts in this arena by growing a relationship with a fish farming operation who was renting part of a company owned ranch. The fish farm's demand for water quickly grew and encroached upon the existing demand of the remaining farm's corn, cotton, and almond crops. Through a collaborative effort, both operations came together to devise a recycling system. All fresh water is now sourced to the fish and then is returned as 100% waste water for farm reuse. This symbiosis, while basic in form, provides the primary concept for dual beneficial use of a single water source.

Municipal wastewater reuse systems, while still controversial, have provided some insight into what technology is available for conservation and reuse. The city of Los Angeles is currently reusing over XX% of their wastewater through ground water recharge systems and filtering methods. Dan Welkel of the LA Times cited the recent completion of an Orange County plant which treats over 70 million gallon of wastewater daily. The project completed by the Orange County Sanitation District and Orange County Water District cost an estimated \$420 million. The plant treats the water to near distilled water quality before pumping it back into the ground to recharge the underground aquifer and mitigate salt water intrusion problems. The Orange County Sanitation District currently discharges over 240 million gallons of water into the ocean. They think that through similar systems they could reduce that number by half.

Produced oil wastewater has been a problem for the oil and gas industry for many years. Only recently has oil wastewater been considered more of an asset. It can now be reused both for internal operations and outside sales. Chevron USA Inc. has begun to implement two systems of waste reuse that have gained some notoriety in recent years. In Bakersfield, CA, Chevron has developed a type of sand bed media filtering system. The technique uses finely crushed walnut shells and cleans approximately 58 acre feet of wastewater per day. The cleaned water is sent through an 8.5 mile long pipeline where it is discharged to Cawelo Water District for sale to local farmers. The agreement, which was signed in 1994, helps provide an additional source of water at an economical price, while helping Chevron discharge costly waste water.

Again in San Ardo, CA, Chevron has developed a system to clean and reuse their wastewater to power the demand created by their own steam generating system. Steam

generators are used widely in both the Kern Front oil field in Bakersfield and in San Ardo to heat the ground and flood the oil and water into the oil well casing. This process increases the oil production, but also creates a large volume of oily waste water. In San Ardo, Chevron has developed a series of advanced treatment systems which employ heat exchange, degasification, media filtration, engineered wetlands. Finally through an advanced double pass reverse osmosis filtering system developed in partnership with N.A. Systems. The process cleans the water sufficiently to be reused through its existing steam generators which are extremely sensitive to water quality. By recycling the water, Chevron has minimized its waste and has created an alternative source water to supply its existing demand.

While these examples are at different ends of the spectrum for complexity, the concept is the same. The consideration of wastewater as an asset to be better used, or simply used again by another demand. Not as a liability to be discharged to the sea. Clark Bros. Inc. understands this process and has helped many customers work through similar problems.