

# MEMORANDUM

**To:** Saqib Shirazi, P.E., Innovative Water Technologies, Texas Water Development Board (TWDB)

**FROM:** Bradley Sessions, Carollo Engineers Inc.

**SUBJECT:** Brackish Water Desalination Demonstration Project – June 2011

**DATE:** June 14, 2011

**CONTRACT:** 1004831105

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## **Recent Project Activities:**

Major installation of the Calcite pilot and CO<sub>2</sub> system took place the months of March and April.

Additional effort was required in May to finalize installation and start-up. The piloting effort began the week of June 6<sup>th</sup> with lab analysis

Myron L has donated the use of a new field device (9p) to provide an additional method of measuring post-treatment water quality. This device is on loan to the project and will provide a valuable tool for field measurement of pH, TDS, Conductivity, Alkalinity, Temperature, Hardness, and calculation of the Langlier Saturation Index (LSI)

## **March 21-March 25 On-Site Activities**

- Most of the fittings and parts ordered from vendor had not arrived
- Site-layout preparations and clean-up of Lab area for installation effort
- Feed piping from the 2" permeate line along the wall will be routed along the wall to prevent trip hazards as much as possible
- Local purchase of lumber and built the skid for the calcite contactors
- Procurement of feed pump, and ordered relay and flow switch for pump control
- Set up the PVC contactors assembled the piping to- and from- the columns
- TOMCO CO<sub>2</sub> system onsite
- 3 out of 5 calcite manufacturer samples arrived
- Purchased PVC components from local hardware stores
- Determined where to pipe the finished water effluent from the pilot – to the 8" pipe outside of research lab where it is currently unused.
- Noted permeate pressure from plant is 4 psi.

### **April 11-April 15 On-Site Activities**

- Finished water tank sent from Boise arrived. (This was a new requirement to accommodate the request to provide beneficial use of the effluent from the pilot to dilute facility concentrate flow) This tank will be on-loan to the project.
- Sump pump purchased for use with the finish water tank.
- The detention time from the CO<sub>2</sub> injection point to pH probe needed to be at least 15 sec. Piping modified to accommodate 50 ft of hose to increase detention time
- CO<sub>2</sub> tank arrived onsite, but without the appropriate regulator. Normal regulators used for Nitrogen and Oxygen are not appropriate. CO<sub>2</sub> would freeze the regulators and so a new one needed to be purchased. Connection to and from the tank were not standard sizing and had to go to a local welder/supplier for refitting.
- 1.5" Stainless steel nozzle for the CO<sub>2</sub> injection point needed to be customized to fit into the 2" main pipe.
- Completed assembly of the pilot unit
- Facility electrician wired the feed pump
- Arranged for TOMCO service technician for pilot start up
- TOMCO CO<sub>2</sub> system setup complete
- Startup was unsuccessful due to consistent air bubbles in the 2" line (galvanized steel) from the plant. Even after bleeding the line for several hours, the air in-line was still problematic for the feed pump.
- Effort to troubleshoot the source of air entrainment on the feed permeate was unsuccessful. Two possible solutions were identified –extend a nipple into the permeate pipe to draw water from the bottom of the pipe instead of the top, or pump permeate into the CIP tank and use it as a feed tank. Modification of the permeate pipe was not feasible because there were no isolation valves anywhere along the pipeline which would interrupt facility production. The CIP tank solution was chosen as the best solution to avoid facility production interruptions.
- Connect the product tank to 8" line outside research lab outstanding.
- Observed a couple of piping leakages on the skid.
- TOMCO system needed a 40 psi pressure above line pressure to allow CO<sub>2</sub> to mix with water and form carbonic acid. A separate feed pump into the TOMCO system is needed to accommodate this requirement.

### **May 12 – 13 On-Site Activities**

- Completed piping and pump installation from CIP tank to pilot.
- Reviewed operation of the CIP tank and pilot with Plant Superintendent and Assistant Superintendent
- Completed piping from pilot to drain
- Installed piping and booster pump for TOMCO CO<sub>2</sub> system
- 2 pumps were wired by EPWU electrician to accommodate the new CIP supply
- Began piping and pump installation from effluent tank to wet well
- Wet tested the pilot with permeate from the CIP tank

## **May 18 – 19 On-Site Activities**

- System check of TOMCO system by their personnel
- System check of TOMCO system with pilot skid, including process upsets and failure mode simulations
- Fixed several leaks in piping on the pilot skid
- TOMCO personnel trained Carollo and UTEP personnel on operation of the CO<sub>2</sub> system
- Trained UTEP personnel on operation of the pilot skid
- Reviewed pilot protocol and schedule with UTEP

Start-up of the Calcite pilot began the week of June 6<sup>th</sup>.

### **Issues Encountered:**

During the installation effort in April, testing of the feed pumping to the pilot system revealed air entrainment in the permeate supply to the lab would hinder operation. An alternative permeate supply was identified (using the plant's clean-in-place tanks) and the pilot supply was modified to accommodate the new permeate source.

Additional pumping was required on the CO<sub>2</sub> system flow in order to boost pressure 40 psi above the system pressure.

### **Items to be Addressed and Anticipated Project Activities:**

Operation of the pilot has begun, with UTEP being directly involved in the operation and lab testing. Coordination with UTEP will remain a top priority to keep the project operating per the project protocol and to mitigate schedule slips.