

**CONTINUOUS COUNTERCURRENT ION EXCHANGE APPLIED TO CBM PRODUCED  
WATER TREATMENT IN THE POWDER RIVER BASIN OF WYOMING AND MONTANA**

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Development of CBNG (coal bed natural gas) reserves in the PRB (Powder River Basin) produces associated waters with varying levels of sodium and other cation constituents that are necessary to remove before the water can be discharged.

Since its creation in 2002, EMIT Water Discharge Technology has treated over 100,000,000 bbls of PRB CBM water using Severn Trent Services Higgins Loop™. The Higgins Loop™ CCIX (Continuous Countercurrent Ion Exchange System) uses cation exchange resins to remove the cation constituents of the water and concentrate them into a small volume (less than 1% of the treated water volume) brine stream. HCl (hydrochloric acid) is used as a regenerate and produces a NaCl waste stream that is compatible with connate disposal well fluids. The EMIT process also utilizes an air stripper for bicarbonate reduction and pH modification and a CaSO<sub>4</sub> (gypsum) blending step for reduction of the treated water SAR (sodium adsorption ratio). EMIT currently operates 18 systems in the PRB of WY and MT with a total capacity of 320,000 BWPD.

The EMIT process has proven to be an effective way to treat CBNG water because it is flexible enough to meet differing water treatment requirements; has consistent, predictable results, has high runtimes that result in higher gas production rates and is economic to operate.

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