

## Evaporator Reduces Wastewater Volume for Dakota Gasification

### Evaporator integral to stringent zero liquid discharge (zld) waste requirements

American Natural Gas (ANG) developed a coal gasification project in Beulah, North Dakota in the early 1980's to produce pipeline gas and various other products. Basin Electric, the local utility, acquired the plant in 1988 and renamed it Dakota Gasification.

### The Problem

Environmental regulation prevents gasifier waste effluent from being discharged to the environment. A system was required to assure zero liquid discharge of the gasifier liquor.

### The Solution

Aqua-Chem ICD worked very closely with ANG to develop and test a process to assure zero liquid discharge. Following the test phase, ANG selected Aqua-Chem to supply the evaporation system.

A 4,000 gpm gas liquor stream is supplied as makeup water to the plant cooling loop, with the cooling towers operating at a 10X concentration. The 400 gpm cooling tower blowdown is fed to the Spray-Film® multiple effect evaporator system, also operating at 10X concentration. The resulting 40 gpm concentrate is recycled to the gasifier. The recovered 360 gpm distillate stream is used as plant utility water or cooling tower makeup, depending on the season.

### The Results

The Aqua-Chem ICD Spray-Film® system has operated at design capacity continuously since startup in 1984. Maintenance and cleaning cycles have been per design.



# PROJECT PROFILE SERIES # 13

## Technical Data: Water Chemistry

Feed, TDS .....	1.3%	Thiocyanate, CNS <sup>-</sup> .....	1640 ppm
Feed rate .....	400 gpm	Silica, SiO <sub>2</sub> .....	200 ppm
Calcium CA <sup>++</sup> .....	50	TDS .....	12,000 ppm
Iron Fe <sup>++</sup> .....	25	TSS .....	1,200 ppm
Sodium, Na <sup>+</sup> .....	250	Chloride, CL <sup>-</sup> .....	50
Bicarbonate, HCO <sub>3</sub> <sup>-</sup> .....	20	Sulfate SO <sub>4</sub> <sup>++</sup> .....	315
Magnesium, Mg <sup>++</sup> .....	20	Fluoride F <sup>-</sup> .....	8
Ammonium, NH <sub>4</sub> <sup>+</sup> .....	2,640	Conductivity, umhos .....	10,000
Fatty Acids .....	5400	CO <sub>3</sub> <sup>--</sup> .....	0
pH .....	6.5-8.0		

## Flow Diagram

