Electrolytic Bromine System for Chillers

The **National Energy Technology Electrolytic Bromine system for chillers** produces electrolytic bromine in a sidestream flow of highly cycled cooling tower water by electrochemical oxidation of the chloride and bromide ions present. Electrolytic bromine is an excellent stand alone biocide for the alkaline pH conditions common to such cooling waters. Operated on an intermittent basis, with dosage frequency dependent upon the specific degree of biological control desired, the produced electrolytic bromine converts back to bromide ion and is continuously recycled through the **unit** many times, thus eliminating any need to add dangerous, toxic chemical biocides to the cooling tower. Note that the **technology** can only be used on cooling tower systems using 100% softened makeup water and which are cycled to a minimum conductivity of 4,000 mmhos.

Units are supplied as two components, the power supply and a sidestream electrolytic cell; or as a complete ready to operate assembly mounted on a rack. Biocide dose frequency and length is controlled via an external timer unit or controller; turning the unit on and off, such as a typical cooling tower controller with a biocide timer function, or via an optional unit timer. Controller fuses may have to be changed as the current draw of the unit is higher than a typical chemical biocide pump.

Sufficient bromide ion is provided in the cooling water for operation of the **system** with use of either PCT 6460 B, 6461 B, or 6462 B SofTek tm water treatment products at the recommended dose levels.

The power supply is produced in one power rating, 10 amps, which can produce approximately 550 to 3,000 grams/day of electrolytic bromine dependent upon cooling water conductivity and the electrolytic cell used. Using a desired control range of 0.5 to 1.0 mg/l bromine in treated cooling water, this unit can treat cooling systems ranging from 100 gallons to as high as 100,000 gallons. The **system** power supply is equipped with both manual and automatic voltage control for adjustment of the amperage applied to the electrolytic cell so that full electrolytic bromine output can be obtained at varied cooling water conductivity levels.

Electrolytic Cell

Electrolytic cells are constructed using seven (7) plates of patented[i] ultra high density impregnated graphite with 0.25 inch spacing between the plates inside of a four (4) inch diameter heavy wall clear PVC outer shell good to 150 psi. The inlet and outlet port connections are one (1) inch fnpt. Cells should be installed vertically with valves and unions at both ports for easy inspection and replacement, inlet water must enter the cell from the bottom. Electrical connections are also at the bottom, flange end, of the cell.

Power Supply
The amperage limited power supply is a solid state linear unit designed to provide direct current at a rated output of 10 amps and maximum voltage of 55. Voltage is adjustable over the range of 20 to 100% via a panel mounted control to adjust unit output amperage to compensate for various cooling water conductivity levels. At maximum output, the unit will require approximately 650 watts, 6 amps at 110 vac, The power supply is constructed in a NEMA 12 steel panel box to NEC requirements using UL approved components and is fan cooled. Standard features include a power output amp/volt meter, on-off power switch with indicator, voltage adjustment potentiometer, and fuses on both low and high voltage circuits.

Options
options: - power supply and electrolytic cell rack mounted
- dose control timer
- unions and isolation valves on electrolytic cell
- flow sensor - shutdown control

Operational Data/Information
Cooling water conductivity should be cycled to values between 4,000 and 40,000 mmhos for proper operation. Unit voltage is to be adjusted dependent upon cooling water conductivity to obtain 10 amp output.

Never operate the unit without flow through the electrolytic cell, power the timer off the cooling tower pump starter circuit, install a flow monitor, or use a chemical treatment controller equipped with a flow monitor. Minimum recommended flow rate through the electrolytic cell is 5 gpm, preferred is 10 gpm, with a maximum using one (1) inch inlet and outlet piping of 20 gpm. Do not inject any treatment chemicals into the inlet or outlet piping for the unit.

The unit should be operated on an intermittent basis to obtain a bromine level of 0.5 to 1.0 mg/l in the treated cooling water at 30 minutes after termination of operation. For test purposes, cell effluent water should be diluted 1:10 before undertaking any colorimetric bromine test. The following table relates conductivity and cell Model to bromine production.

Conductivity	2000 Cell	3000 Cell
4,000	565 grams/day	845 grams/day
8,000	1,235 grams/day	1,600 grams/day
12,000	1,565 grams/day	2,260 grams/day
16,000	1,940 grams/day	2,800 grams/day
20,000	2,300 grams/day	3,080 grams/day

i US Patent #7,927,470