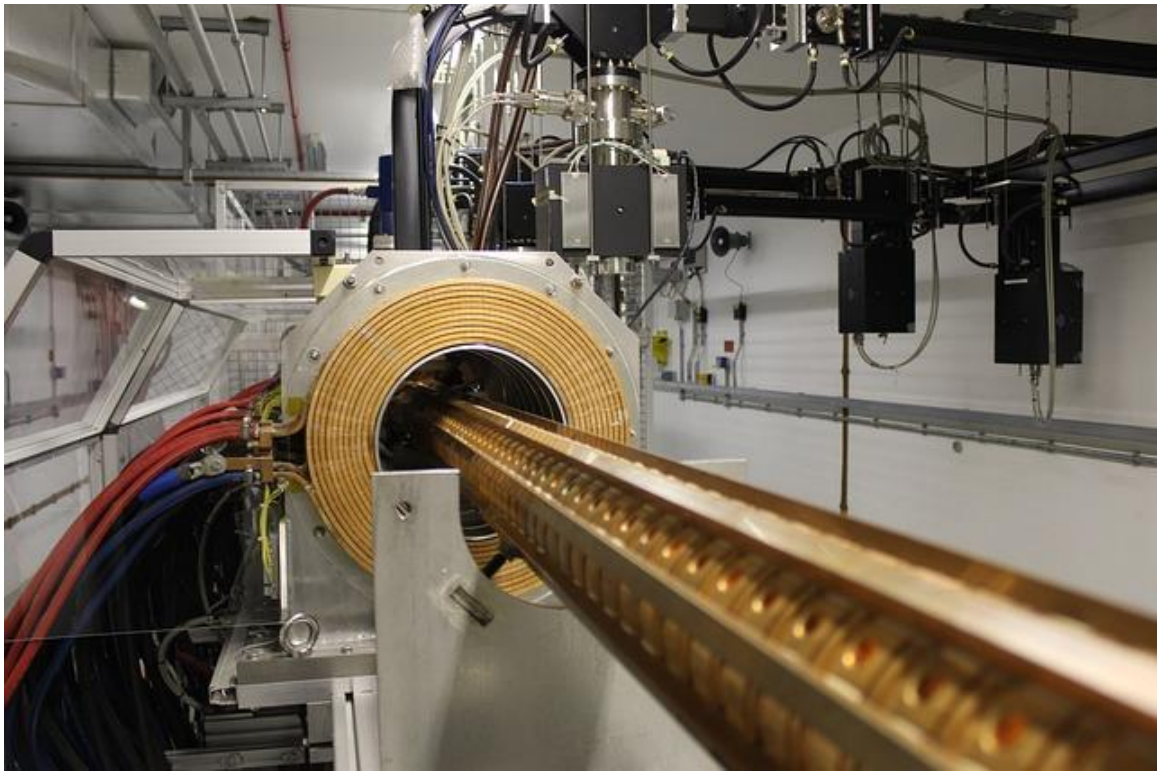
Bates Linear Accelerator Project

Massachusetts Institute of Technology

Ten Year Study



Reduce Discharge or Face Closure

When the project covering the installation of the Bon Aqua water treatment system on the 2000-ton evaporative cooling towers started, the major goal was to achieve a bleed-down discharge level of less than 2000 gallons of water per day. Permits are a state requirement for amounts higher than 2000 gpd. The Bon Aqua treatment enabled MIT to meet the strict requirements of the State of Massachusetts and kept the system running at peak efficiency.

The Problem & Solution

MIT installed a 2000 ton cooling system without the required permits for the discharge water. The bleed down discharge went to a trench around the parking lot. In the spring of 1997, the Massachusetts DEP found the discharge going to the trench with no permits, and gave MIT three options.

- Shut the place down due to no permits – which they could not do
- Get permits and bury the discharge in a large leach field (like a septic system)
- Find a way to limit the total discharge coming from 2000 tons of cooling systems to less than 2000 gpd, and not be required to have special permits

By using Bon Aqua treatment, we were able to guarantee the less than 2000 gallons per day requirement of the tower bleed-off discharge water. The quantities are documented to confirm these results. The cycles of concentration had increased from 5 to 22.

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Water Costs Reduced

Municipalities include a sewer charge along with a water usage charge when they bill customers. That sewer charge covers the cost to treat contaminated water to make it potable once again, using large amounts of clean water in the process. Commercial customers have a larger burden due to the addition of chemical treatment to their equipment, along with the evaporation that takes place. In the case of evaporation, they still have to pay for the treatment of that water even though it is not going into the sanitary sewer, but evaporating into the air.

MIT reduced their water usage and discharge by increasing their cycles of concentration, and since they were using Bon Aqua environmental treatment on their cooling system, there were no toxic chemicals in their discharge water, a decision that brought major savings to this project.

(Note: Linear Accelerator Project discontinued due to lack of funding in 2007. Bon Aqua treatment was in use during that 10-year period.)
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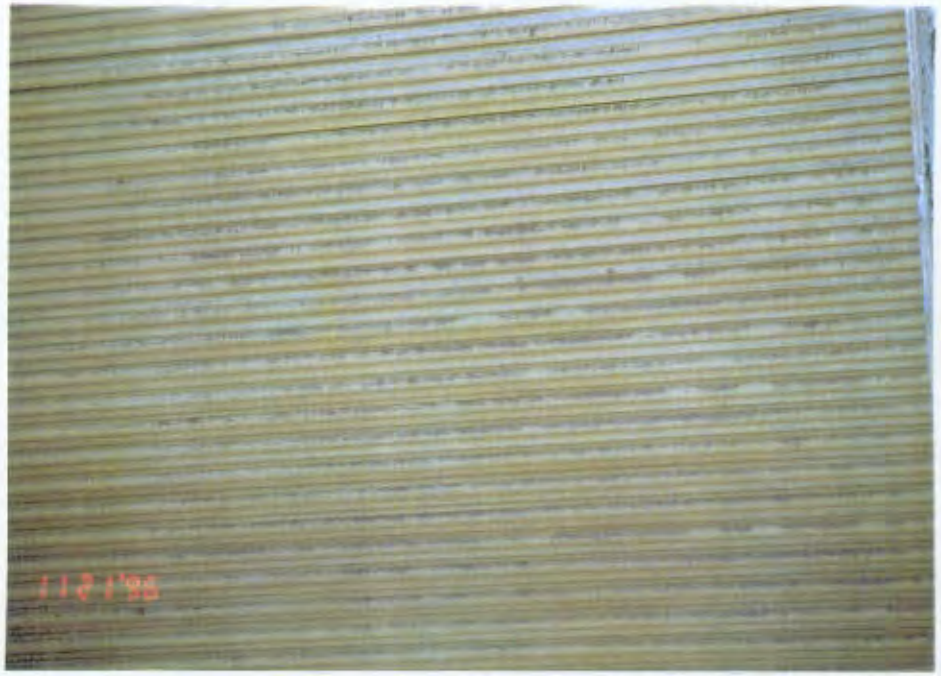
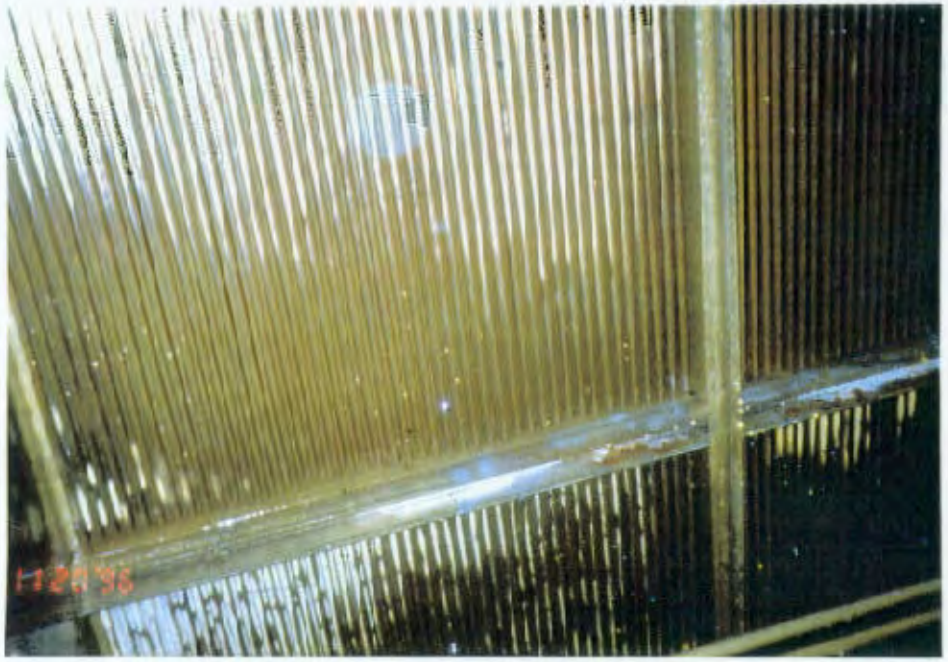
PHOTOGRAPHS - MASSACHUSETTS INSTITUTE of TECHNOLOGY, BATES LINEAR ACCELERATOR RESEARCH CENTER, Middleton, MA. November 20, 1996 Evaporative cooling tower E-1. Pictures show some scale\ deposit build-up on the tube bundles.

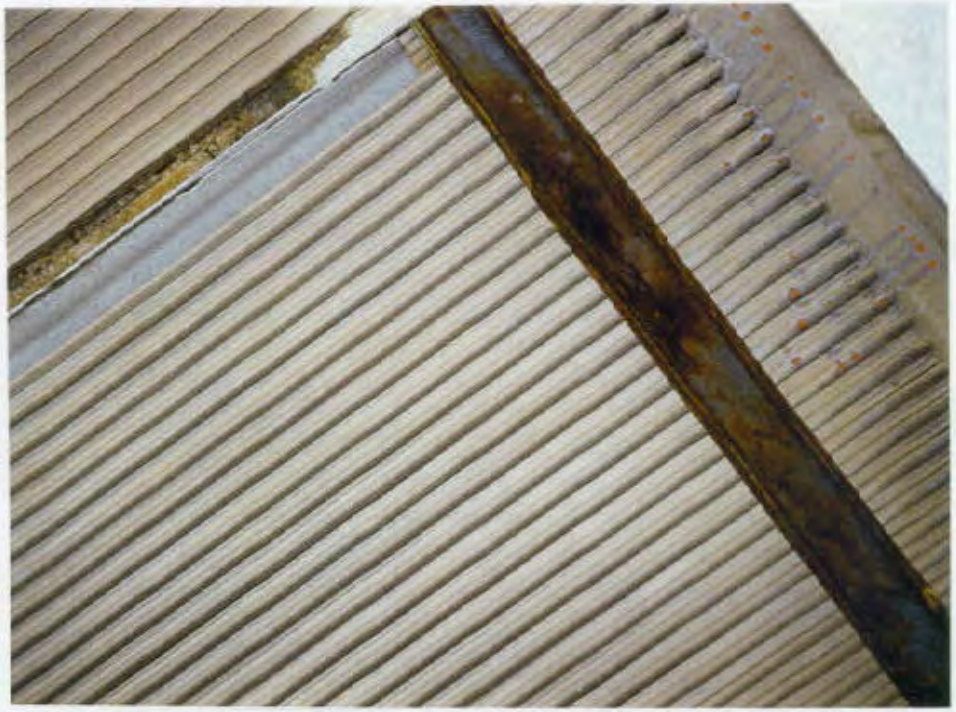


November 20, 1996



November 20, 1996

PHOTOGRAPHS - MASSACHUSETTS INSTITUTE of TECHNOLOGY, BATES LINEAR ACCELERATOR RESEARCH CENTER, Middleton, Massachusetts. June 20, 1997 Evaporative cooling tower #E-1 These photographs show a significant reduction in the pre-existing scale since the Bon Aqua water treatment system was installed in November of 1996.



June 26, 1997

June 26, 1997

Massachusetts Institute of Technology
Bates Linear Research Center
Middleton, Massachusetts
Cooling Tower Make-up and Bleed-down Water Volumes on 650 ton Evapco fluid cooling tower

Date	Make-up Meter Cubic Feet	Increment Diff.	Discharge meter Cubic Feet	Increment Diff.	Days in Period	Discharge/day Cubic Feet
6/10/97	82,800		4,100			
		9,100		500	19	26.3
6/19/97	101,900		4,600			
		27,260		1,100	29	37.9
7/17/97	129,160		5,700			
		54,940		2,100	36	58.3
8/21/97	184,100		7,800			
		45,490		2,120	28	75.7
9/18/97	229,590		9,920			

Date	Make-up Meter Gallons	Increment Diff.	Discharge meter Gallons	Increment Diff.	Days in Period	Discharge/day Gallons
6/10/97	696,000		30,750			
		68,250		3,750	19	197.4
6/19/97	764,250		34,500			
		204,450		8,250	29	284.5
7/17/97	968,250		42,750			
		412,050		15,750	36	437.5
8/21/97	1,380,750		58,500			
		341,175		15,900	38	567.9
9/18/97	1,721,925		74,400			

NOTE: At the beginning of the test November, 1996 the tower was being run at 5 cycles of concentration. By June, 1997 the cycles had been increased to 22 cycles of concentration, resulting in a saving of 500,000 gallons of make-up water and bleed-down discharge, and an obvious reduction in scale as evidenced in the accompanying photos.