St. George

STrong **G**radient **E**lectromagnetic
Online **R**ecoil separator for
capture **G**amma ray **E**xperiments

Infrastructure Discussions

February 7, 2006

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Ed and I traveled to Michigan State University on Friday to visit the National Superconducting Cyclotron Laboratory

We met with

Thomas Glasmacher

Professor and Associate Director for Operations, and

Jim Wagner

Head, Fabrication and Assembly Department

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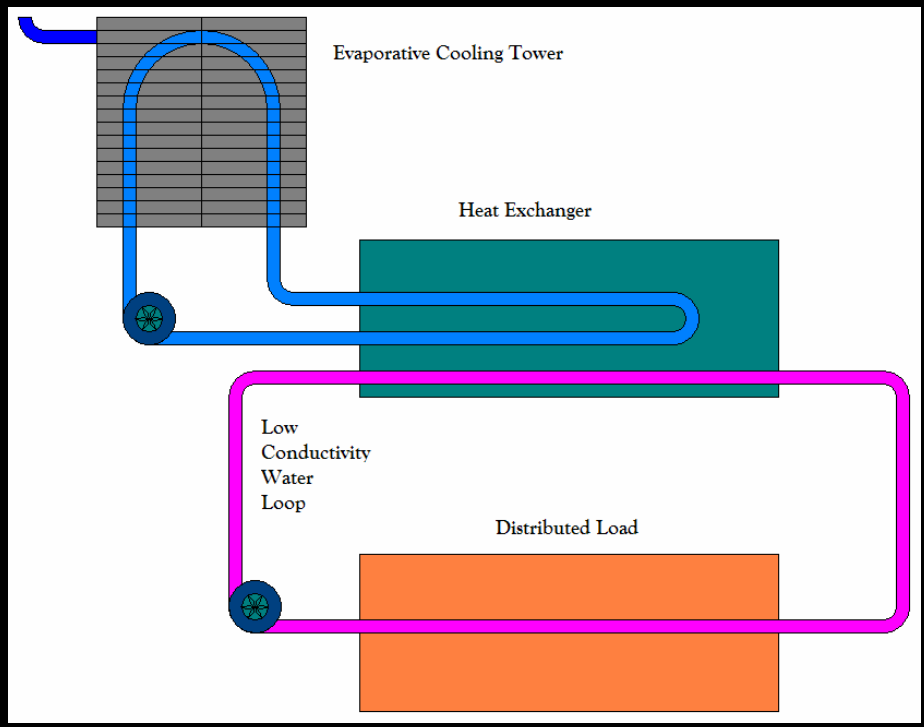
They use evaporative cooling rather than chillers, due in part to the very large volume of water involved, nearly an order of magnitude more water than we would require for the St. George project.

Not shown in this simple diagram are the redundant pumps, mixing valves, storage reservoirs, and water distillation stations to provide make-up water for the Low Conductivity Water (LCW) loop.



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Evaporative cooling vs. Chilled water

Evaporative is probably cheaper for large volumes, but will necessitate operation at higher temperatures. For NSCL, “cooling” water temperature is 85 – 92^{o}F, much higher than the 65 – 70^{o}F that we are accustomed to.

We **MUST** be able to run, at full power, even during the hottest and most humid days of the year. If evaporative cooling is used, it **must** be capable of sustained operation of the St. George facility.

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Evaporative cooling vs. Chilled water

We will need to hire a firm to do routine maintenance on the water system, to insure that evaporators are in good working order, that the primary loop is within limits, and that the LCW is at specifications.

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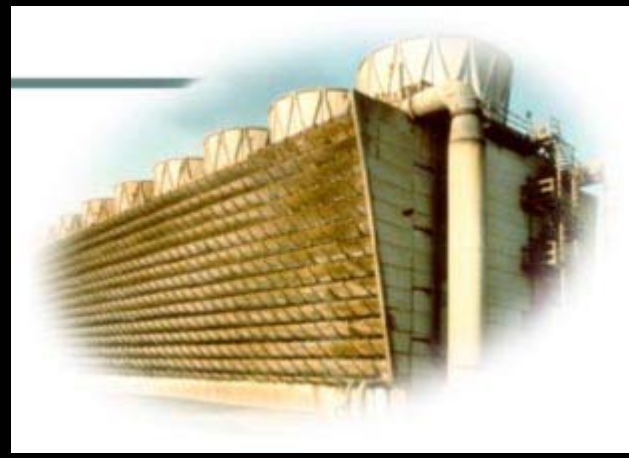
NSCL uses Rochester Midland.

RMC
Rochester Midland Corporation



Proper treatment and maintenance of closed loops (hot or chill water) are an RMC strong point. Our series of products are formulated to keep closed systems clean and passivated for adequate corrosion protection. RMC Product Specialists' can recommend a treatment program tailored especially for your needs and situation. RMC Product Specialists' have the ability to diagnose potential problems (biological or other system contamination problems) that could determine how well your closed loop operates.

In maintaining a clean system, there is less downtime for system repairs, pump seal replacements, and cleaning of heat exchanger equipment. The RMC Product Specialist also has the expertise and training to maintain old closed loop systems that may not have been treated properly in the past. Side stream filtration, system pre-treatment, and on-line closed loop clean-up are methods available to ensure your closed loop operates at peak efficiency.

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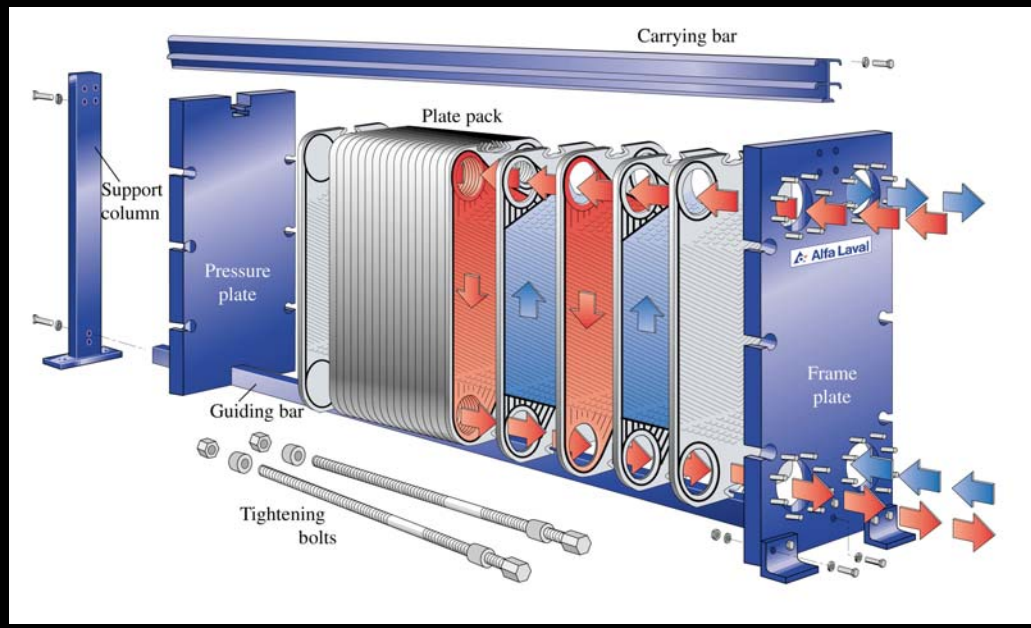
Heat Exchangers

Jim Wagner **strongly** recommended that we use plate style heat exchanger units, as they have proven very reliable and very easy to maintain at NSCL.



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Distillation Stations

NSCL does **NOT** actively treat the LCW to maintain the required purity. Rather, all the water in the system is provided by distillation systems (manufactured by Barnstead), and only particulate filtration is required to keep the system clean and at low conductivity.

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Water Purity Issues

This should work for St. George as well, assuming we take care to initially install clean plumbing throughout the entire low conductivity cooling water system.

BUT….. We **cannot** mix our existing lab cooling water system with the St. George system, as this would certainly cause contamination of the LCW system. We can only run untreated LCW if we maintain the initial very clean conditions.

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Other Cooling Water Issues

We will need to provide cooling water for beam line components such as slits and Faraday cups. This should probably be provided by a small but separate cooling water facility, perhaps something like a dedicated Haskris chilled water unit.

We might not need to actively treat this water to maintain low conductivity, as we could purge the system and replenish the small volume of water required if the system were to become contaminated.

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Other Cooling Water Issues

If we want to investigate the cooling water needs of the entire department and/or building, we will certainly need to understand that several completely separate LCW loops would be required, and for some, active treatment of the water to maintain low conductivity would be required. And, it may be that the temperatures available from an evaporative system would be too high for many applications.

But we need to get something moving towards providing a solution for the St. George project **NOW**.

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Engineering Consultants?

Do we want to design the system ourselves (who would that be?) or is it better to hire an outside engineering firm? We are **very** concerned at the additional cost that this would place upon the system.

Jim Wagner highly recommended an engineering firm that we might want to consider, and I believe that we are already familiar with them.

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Fishbeck, Thompson, Carr & Huber

University of Notre Dame New Cooling Tower and Condenser Water System Revisions

As a result of a fire and explosion, which destroyed six cooling tower cells and the newly upgraded electrical service to nine towers, FTC&H was hired to evaluate the university's entire condensing water system, including cooling tower capacity, pumping capacity, piping scheme, and the intake and outfall systems.
The resulting study recommended an increased cooling capacity, more than double the installed capacity before the fire. The magnitude of the capacity increase required an upgrade of the entire condensing water system. The condenser water pumping and piping system to the towers was completely redesigned, replacing five of six vertical turbine pumps. Thanks to a fast-track schedule, the new tower system successfully started up before the 2000 cooling season.

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Air Conditioning Issues

NSCL uses Trane standing units, typically 5 to 7 ton units, to provide air conditioning for target rooms, and they use the LCW loop to cool the coils in these units too. Couldn’t we do something similar? Would this provide a solution for the air conditioning we need to maintain a reasonably constant air temperature in the room at a reasonable relative humidity?

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Electrical Power

What is the status of the electrical power situation?

- Where will the power come from?
- How much will be available?
- Will there be any Emergency Back-Up power?
- When will it be available?
- What funds are available?

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Shielding Wall Issues

What have we learned about removing the existing wall and building a new, modular shielding wall?

- Are there any issues about the load bearing aspects of the existing wall?
- Have we learned anything about materials that would be available to build the new modular wall?
- Would it be possible for our lab personnel to build the new wall?
- When could we begin to remove the existing wall?
- What funds are available?

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Danfysik 625 Wien Filter

Power: 4 kW, water cooling

Pressure Drop, min. : 5.0 bar

Total Flow Rate : 4.0 l/min = 1.1 g/min

Inlet Temp. : 25^{o}C = 77^{o}F

Max. Temp. rise : 14^{o}C = 25.2^{o}F

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