

# TECOCHILL®

## STx Series CHILLER

### CASE STUDY

## MARINE BIOLOGICAL LABORATORY



## Still cooling after all these years

*The Marine Biological Laboratory (MBL) on Cape Cod will use a portion of its state funding to install a fifth Tecogen chiller as part of a green-building initiative*

WOODS HOLE — It seems only natural a world-renowned research laboratory that places great emphasis on scientific inquiry to improve the human condition would do the same when it came time to renovate its facilities.

That's just what the Marine Biological Laboratory (MBL) in

Woods Hole, Mass. will do during its renovations of the Loeb Laboratory.

Armed with a \$15 million grant awarded by the Howard Hughes Medical Institute (HHMI) in 2008 and a \$10 million grant awarded by the Massachusetts Life Sciences Center (MLSC) in 2007, the MBL is working hard to incorporate energy efficiency and renewable energy features into the building.

To maximize energy improvements, the MBL will cool the facility using a natural gas engine-driven chiller provided by Tecogen, a leading manufacturer of combined heat and power products. In 2010, the TECOCHILL STx, which is part of

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Powered by natural gas instead of electricity, Tecogen's TECOCHILL allows the MBL to significantly reduce its energy costs up to 60% when compared with conventional electric chillers.

Tecogen's line of engine-driven chillers, will be installed in the new rooftop mechanical room above the Loeb building.

The project will mark the fifth Tecogen chiller installed on campus since 1993. Currently, the MBL features 4 state-of-the-art Tecogen chillers housed in the the Lillie Laboratory (installed in 1993), Loeb Teaching Laboratory (installed in 1997). C.V. Starr Environmental Building (installed in 2000), and in the Rowe Laboratory (installed in 2006).

"This funding presents a wonderful opportunity to continue working with Tecogen in order to improve the campus," said Richard Cutler, P.E., the MBL's director of facilities, management, and projects. "Installing a fifth Tecogen chiller contributes to the MBL's goal of keeping the facilities updated with the most efficient technology."

The oldest private marine laboratory in the country, the over a century old institution never had any form of cooling before 1993, so it was important to Cutler to find an efficient cooling method that was sensitive to the local and wider environment. Currently, the MBL has a year-round staff of around 275 scientists and support staff. Every summer, the campus swings open its doors to welcome 1,400 scientists to study the diverse marine organisms found in local waters, including sea urchins, lobsters, squid, horseshoe crabs, and dogfish sharks.

"Before Tecogen, we never had a cooling system, just open windows and the ocean breeze, which is considered authentic Cape Cod air conditioning," said Cutler. "But we knew it was time for an upgrade."

By utilizing natural gas with its low emissions, the MBL is in pursuit of both environmental and energy

savings. The TECOCHILL provides a high efficiency cooling system that allows the MBL to significantly reduce energy costs by utilizing natural gas instead of electricity. The chiller resembles an electric chiller in size, weight, and water flow characteristics but is able to cool substantial commercial buildings without significant electrical use.

Initially, Cutler's team attempted to cool the labs using the ad-hoc system of purchasing portable air conditioning units and fans, which was a common cooling method at the time. Not only were there mechanical problems with the units but they were highly inefficient and caused a serious impact on the campus's operating budget.

Being located in such a remote area also presented major logistical challenges, particularly because of constrained power availability during the peak summer months. It soon became clear cooling the labs with electricity was not a financially viable option; another low-cost sustainable source was needed.

"We were looking for a solution that would cut costs dramatically because after using window units, our monthly electric bills remained unacceptably high," said Cutler. "Natural gas cooling is the ideal choice for the MBL because it significantly reduces energy costs by avoiding the electric demand charges during its peak-cooling season."

Tecogen's technology is about twice as efficient as the other gas alternative, absorption chilling, and many customers benefit from the free hot water



TECOCHILL STx Series CHILLER installed in the Whitman Laboratory in 2007.

byproduct available from the engine. The technology includes hardware required for heat recovery, two thermo-static control valves and customer pipe connections. The MBL was able to use the engine waste heat for the building reheat system, which made the economics particularly compelling.

“Sweet, simple, and efficient—that’s the appeal of Tecogen,” said Cutler.

Moreover, the chiller operates at a higher efficiency than electric chillers because it eliminates two significant losses inherent in the generation of electric power. These losses include transmission and distribution (T&D) and the wasteful discharge of low grade heat at the power station. By contrast, the TECOCHILL system is not associated with any T&D losses and the engine’s waste heat is purposefully used in the labs for reheat dehumidification. These benefits result in about half the carbon emissions as compared to the coupled power plant/electric chiller alternative.

“We are very proud to have the opportunity to work with such a prestigious institution,” said Jeff Glick, Tecogen’s regional sales manager.

The MBL’s rich history of scientific prestige is reflected in the superior caliber of scientists it attracts, which includes 53 Nobel Prize winners. In several cases, many of the Nobel Laureates point to the MBL as the catalyst that launched their career.

“It is extremely exciting to see our technology being utilized in a building that has produced some of the most groundbreaking scientific discoveries in history,” said Glick.



Work is already under way to transform the MBL campus into a more energy efficient operation, including the installation of a second TECOCHILL chiller in the Loeb Laboratory.



TECOCHILL enables the MBL to avoid electric demand charges and “time-of-day” rates, which is critical for a facility that is busiest during the summer.

Recently, the MBL launched a sustainability plan outlining its goals to include significant energy, water use, and greenhouse gas emissions reductions. The TECOCHILL gas powered chiller contributes to this plan, as it boasts environmental benefits as a result of using natural gas. The chiller produces one hundred percent of the cooling with energy derived from natural gas, which is considered to be the most environmentally friendly of the fossil fuels because it has the lowest carbon emissions.

To that end, Cutler views the facilities as a representation of the environmental and educational purposes and goals of the institution.

“We chose Tecogen because they provide economically smart technology that is environmentally responsible—an unbeatable combination,” said Cutler.

The TECOCHILL uses the preferred R-134a refrigerant, which has a 95 percent reduced ozone depleting potential. From an ecological standpoint, this helps preserve the ozone layer and reduce the threat of global warming.

“Working with Tecogen supports the MBL’s goals of making the campus more environmentally friendly,” said Cutler, who is one of the few engineers on campus amongst a sea of marine biologists. Since joining the MBL in 1986, Cutler has worked hard to ensure the quality of the MBL facilities reflect the quality of the people and programs they house.

Notably, gas cooling is not only beneficial for the MBL, but also creates a better quality of living for the residents of Woods Hole. Several years ago, a noise

consultant measured the acoustics around the facility after neighboring homes complained about the ambient sound levels.

The consultant recommended installing more natural gas-engine driven chillers and fewer electric chillers in order to reduce noise and vibration. The consultant's data confirmed that engine driven chillers have a lower frequency noise and are thereby less offensive to the neighbors.

"The consultant described the sounds as a 'low rumbling noise,' which was ideal for us," said Cutler. "We're very cautious with the facilities and try our best to not to disturb anyone in the surrounding area."

Of course, installing a cooling system may not

generate the same attention a major biomedical breakthrough discovered in the labs might, but modernizing the facilities is as important as any project at the MBL, said Cutler.

"A comfortable and controlled atmosphere contributes to the overall experience," he said. "I worry about the buildings so the scientists can focus on their research."



Residents of Woods Hole also benefit from the natural gas cooling system, as the units comply with noise reduction standards.

Prospects are strong for the Loeb Laboratory renovation project, which has already begun to move forward this year. The completion date will be June 2010. Based on previous experience, Cutler expects working with Tecogen will be a breeze from start to finish.



Tecogen's natural gas engine-driven technology fosters the MBL's dedication to environmental sustainability.

"Our ongoing work with Tecogen is representative of their reliability and outstanding economic benefits," said Cutler, who is among the many facilities managers across the country who are realizing the benefits of Tecogen's natural gas engine driven chillers. "They are a trusted partner we can depend on to help us make significant and sustainable growth."

As demonstrated by the MBL's experience over the past 16 years, the development of a natural gas engine-driven technology looks set to emerge as the prominent cooling method in the country.

"The use of natural gas is at the core of our mission because it helps everyone — both economically and environmentally," said Glick, who is excited to continue collaborating with the MBL.

"We have built a solid track record with the MBL based on achieving reliable, fair, and cost-effective cooling options," he said. "We are incredibly grateful to both Cutler and the MBL for their uncompromising loyalty over the years. We are thrilled to have this chance to work with them again."

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