

CREATING COOL CASTLES FOR KING DATA

Aquatherm pipe installed (right) in a modular data center and fabricated spools in place and awaiting installation (left).

PROJECT:

Modular Data Centers
Cooling System

PRODUCTS:

aquatherm blue pipe®

LOCATION/DATE:

Ontario, Canada
2019

AQUATHERM ADVANTAGES:

- The light weight of Aquatherm pipe was a key factor for this customer, who needed to be able to ship units anywhere in the world
- Aquatherm's virtually leak-free heat fusion connections are an important consideration in mission-critical applications such as data centers
- This customer chose to send drawings to Aquatherm Fabrication Services and have trained fusion experts fabricate the custom pipe assemblies

Aquatherm provides a tough, lightweight solution for modular data centers

It has been said that "data is king" and that's easy to believe in today's information-driven world. Across the global business landscape, massive amounts of data are being gathered, stored, and mined in ways undreamt of just a generation ago. The task of storing all that data falls to data centers, which house the computer racks and servers that keep the world of business humming.

Data centers have exploded on the scene in such numbers that it is difficult to ascertain how many there actually are. "Millions" is the only plausible answer, and the number grows daily. The largest can cover millions of square feet and house tens of thousands of servers, but the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy notes that the majority of data centers consist of small server rooms and closets found in a variety of buildings owned by small- and medium-sized businesses and organizations.

Because of the heat they generate, data centers represent a significant challenge and opportunity for HVAC personnel. The mission-critical nature of data centers means there is little margin for error when it comes to meeting their cooling demands.

MODULAR DATA CENTERS

To help meet the need for reliable data centers in the vast market of small- to medium-sized businesses, a Canadian manufacturing company has created a modular data center product that is self-contained and designed to be mounted on the roof of a client's building.



The piping on this modular data center was custom-fabricated by Aquatherm Fabrication Services and shipped to the site ready to install.

The company specializes in switchgear, prefabricated electrical buildings, alternative energy solutions, automation systems, and is a full system integrator of electrical equipment from 280 volt up to 34.5 Kb. When it came to expanding its business into modular data centers, two factors were of prime importance: robust dependability and weight. The need for bulletproof dependability when being entrusted with customers' crucial data is obvious, and the weight considerations stem from ensuring that the units can be shipped to clients anywhere in the world. That meant the company was seeking alternatives to steel piping, which is heavy and vulnerable to corrosion and potential leaks.

The company's engineers researched other piping solutions, and also sought input from their local HVAC supplier, WFS Ltd. These efforts led to the discovery of Aquatherm

polypropylene (PP) pipe, and the company's owner knew immediately that it would fit the need for a tough yet lightweight solution.

The first modular data center the company produced measures 80 ft by 40 ft. It contains 40 racks, in-line chilled water coolers, two substations, and two 750 kW uninterruptible power supplies. It is designed to be shipped in two independent, complete modules that can be integrated on site very quickly.

"The fabrication done [by Aquatherm] was fantastic. I was at the site when the fabricated spools of pipe were delivered and [the owner] was very happy with the quality."

— Trevor Smith, account manager, WFS Ltd.,
Leamington, Ontario

"When we look at the chilled water supply to the inline coolers, if we used steel piping the building module itself would have been overweight for the transportation permits for our provincial roadways without doing a very expensive road survey," the owner said. "We also must be aware of the weight load on customers' roofs. Aquatherm piping represented a great opportunity for us to lighten the data center while maintaining a very highly reliable chilled water supply to the inline coolers."

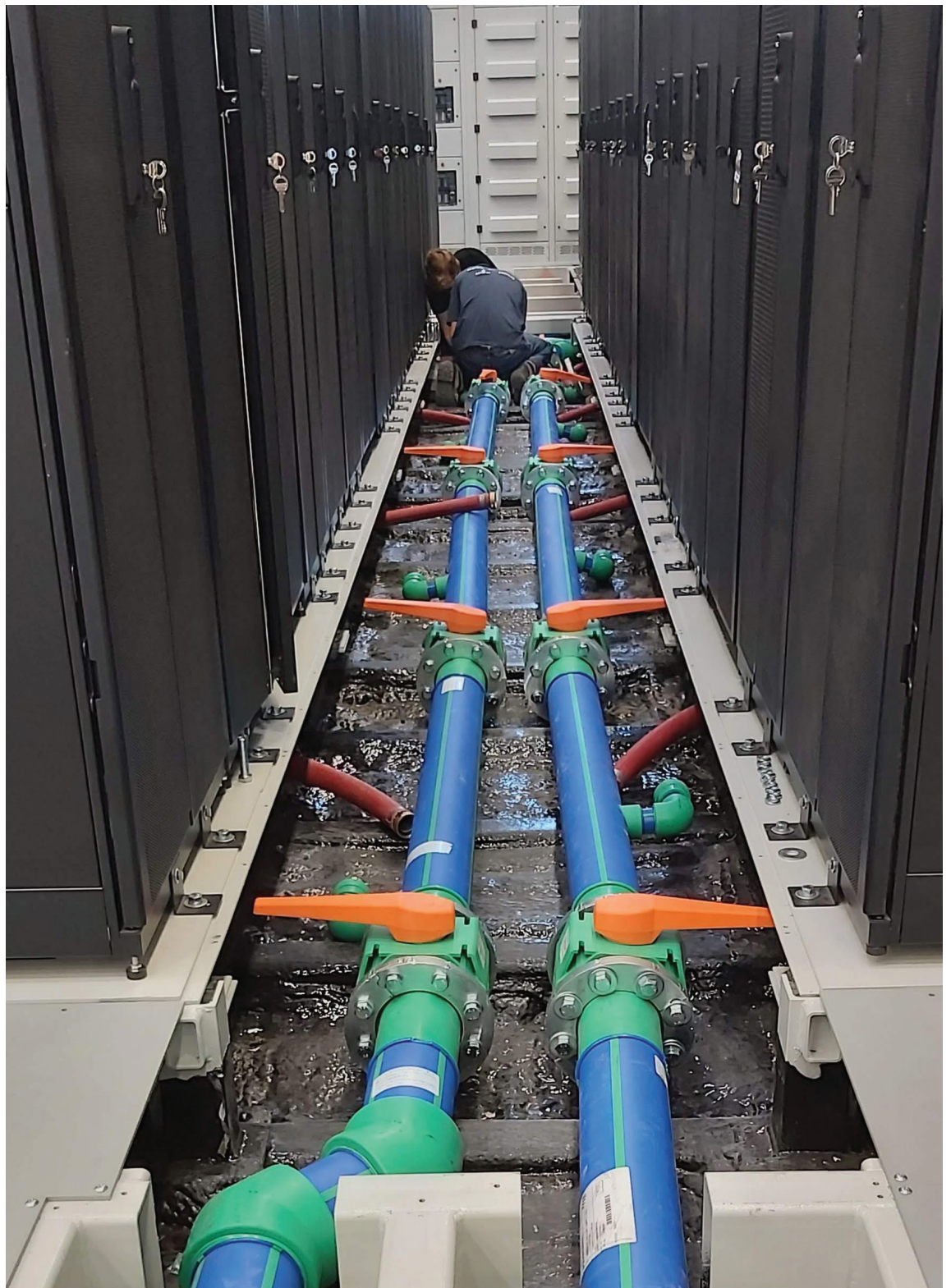
THE SYSTEM TAKES SHAPE

For the initial data center, the company used 300 ft of 4-in. Aquatherm Blue Pipe® for the supplies and returns, teeing down to 1½-in. at the inline coolers. The system also includes 41 flanged valves.

Aquatherm provides training on the heat fusion joining process, but the company chose to send drawings to Aquatherm's Fabrication Services in Lindon, UT—where Aquatherm has more than \$2 million invested in cutting-edge fusion equipment and more than 30 highly trained fusion fabricators—and have the custom pipe assemblies fabricated there. Fabrication at Aquatherm takes place in an optimized, controlled environment to ensure the highest quality, and the finished assemblies can be shipped directly to any jobsite in North America.

Aquatherm also offers estimation, BIM support, fabrication drawings, and a Scan-to-Fab service that ensures accuracy of as-built measurements, dramatically reduces field measurement time and project timelines, and facilitates quicker installation.

"Aquatherm actually built out the various 'Legos' for us in sections, so when they arrived it was very easy for our guys to subassemble them into the floor of the modular house," the owner said.



Workers completing the installation of 4-in. Aquatherm pipe spools in the "floor" of a modular data center "house."

Aquatherm's comprehensive 10-year warranty, which covers fusion joints made by Aquatherm-trained personnel and all assemblies fabricated by Aquatherm, also was an important factor.

"The support of the insurance backing is a really key benefit," the owner noted.

WEIGHT, FOOTPRINT MAJOR CONCERNS

The owner explained that his company's goal is to ship out a unit that is 100 percent intact, including the HVAC, electrical, and uninterruptible power supply.

"Many of our opportunities are in remote, secluded locations, so we want to make sure our system is as complete as possible when we ship, with little to no interconnection required when it is received on the customer's site," he said. "Other than hooking up their power cable and their fiber communication, everything else is finished."

The cooling equipment inside the data centers will vary based on customers' needs. For example, the company can use closed-loop systems for smaller server racks, but higher kW usage calls for chilled water plants. One system the company is exploring consists of 20 computer racks that will require 484 tons of cooling.

“Footprint and weight are both very important to us, especially with the larger units,” the owner noted. “The challenge for us is always to keep the weight down so the unit can be easily transported, and keep the height down so we can easily get under overpasses. Therefore, we’re always looking for new solutions that will reduce the footprint, reduce the weight, and increase the capacity.”

Given that clients will be receiving a “plug-and-play” unit, it’s likely that they may never know that Aquatherm pipe is inside their modular data center. But it’s also likely they would be pleased to know that their valuable data is in good hands. Aquatherm has been selected for the cooling systems of some of the world’s most powerful supercomputers, such as the “Sequoia” and “Sierra” supercomputers at Lawrence Livermore National Laboratory in Livermore, CA, as well as large data centers across North America (visit <https://aquatherm.com/case-studies-library>).

Aquatherm’s heat fusion process eliminates welding and bonds both sides of a joint into a single, homogenous material without the use of chemicals or mechanical connections. This eliminates systemic weaknesses and potential fail-points or leak paths in the pipe. In addition, Aquatherm PP piping doesn’t corrode, so it won’t wear out, weaken, or clog, even after decades of service.

IMPRESSING A DEMANDING CUSTOMER

Trevor Smith, account manager, WFS Ltd., had been working with the manufacturing company on various projects for about 10 years. When he learned that the company was going to start producing modular data centers, he knew that Aquatherm pipe would be able to lighten the load both literally and figuratively.

“[The owner] is very particular and demanding,” Smith said. “So I knew he would be interested in learning about Aquatherm.”

Smith noted that not only is Aquatherm pipe lightweight, it also is aesthetically pleasing.


“The fit and finish of the pipe was important to [the owner] even though in all likelihood no one will ever see it,” Smith said. “So it’s really saying something when I tell you the fabrication done in Lindon was fantastic. I was at the site when the fabricated spools of pipe were delivered and [the owner] was very happy with the quality.”

Smith added that using Aquatherm in modular data centers really demonstrates the pipe’s versatility.

“If a system is running hot or cold water, Aquatherm is always going to be top-of-mind for me,” he said.

POISED FOR GROWTH

The modular data center market is poised for growth, and the cooling capacities required by increasingly large and sophisticated data center equipment are only going to increase. Both of these factors indicate that Aquatherm will continue to be a solution to help this company and other modular data center manufacturers meet their customers’ demands now and in the future.

“We have several new opportunities that we’re quoting on—ultra-high-density data centers that require a substantial amount of cooling,” the owner said. “So we’re probably going to see a big increase in the amount of Aquatherm piping in our units going forward. It’s a quality product and we plan to use it as the primary cooling pipe method in our modular data centers.” 

The German-manufactured pipe has been one of the world’s most durable and greenest piping systems for four decades and proven successful in 70-plus countries. Aquatherm piping systems offer many performance and environmental benefits, such as:

- Eliminating toxic materials, glues and resins, and open flames from the piping installation equation
- An R-value of 1 or more per inch or greater depending on pipe size and SDR
- The fusion welding process, which creates seamless connections that last a lifetime without leaking or failing
- An optional fiber-composite layer in the pipe reduces linear expansion of the pipe by up to 75 percent compared to plastic piping



Aquatherm pipe provides a lightweight, durable solution for the self-contained cooling system in a modular data center.



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