SIEMENS

Case Study

How "better than expected" became best worldwide

Water park boosts safety and performance with Siemens automation and controls

Customer: Lakeside Surf in partnership with Citywave® in Lake Chelan, Washington.

Challenge: Building the first deep-water wave pool in America, keeping it safe and available.

Solution: Engage Applied Motion Systems to design, engineer, and install a fully integrated system of Siemens automation and controls.

Results: Greater flexibility, safety and performance.

Applied Motion SYSTEMS

Slidewaters Waterpark set out to build a surf wavepool attraction to attract an older teen and college-age demographic. Yet in an effort to live by their motto "better than expected," the Washington state waterpark ended up building the biggest Citywave® wave attraction in the world, equipped with Siemens automation and controls designed for safety and performance.

Nestled on the shores of Lake Chelan, Washington, Slidewaters Waterpark has been a summertime family vacation destination for nearly 40 years. Founded in 1983, the park has undergone renovations every decade to modernize facilities and continue to attract visitors and staff. For its most recent renovation, owners Burke and Robert Bordner decided to appeal to an older Slidewaters crowd.

"There are a lot of teens and college kids here in the summer, and we wanted to create something that would draw them back again and again," they say. "As a sport that doubles as entertainment for onlookers, a surf attraction seemed like a perfect fit."

But not just any surf attraction would do. Slidewaters always strived for "better than expected" – its motto for visitor and staff experiences alike – and sticking to that goal meant seeking out the best. Such an endeavor led the Bordners to Citywave surf wave, a German-based company known for bringing surfing to urban settings such as airports and shopping centers all over the world.

"At the time, their specialty was largely mobile installations in cities," says Burke Bordner, "But Citywave was the only surf wave that allowed real surfboards in the pool. In our opinion, that really lets surfers ride the best wave."

As the Bordners got to work defining the scope and requirements of the Citywave wave pool, it became apparent that what they envisioned would require more than just an addition to Slidewaters. An entirely separate park facility was needed to house the wave pool. So, in 2016, Slidewaters started construction next door on the first Citywave wave pool in the U.S., calling it Lakeside Surf. Following their motto "better than expected," the Bordners relied on Citywave's well-tried and approved technology to deliver on that promise, but they needed a U.S.-based expert resource to design and build the electrical and control systems to operate the wave attraction and ensure the safety of guests using it.

Challenge: Building the largest deep-water wave pool in America, keeping it safe and available

Most Citywave installations were operated by wave "artists" – a term of admiration Burke Bordner uses to describe the experienced Citywave operators he previewed during the vetting process.

"The first time we saw a Citywave wave pool, we were impressed by how realistic the wave was, but it was a very precise process for the operators," says Bordner. "Even little adjustments in the water flow would make or break a wave. Because we've always hired teenage and college-aged employees in need of a summer job – our oldest employee is 22 – we knew our controls needed to be simple, easy-to-use, and user-friendly for all our staff."

The season at Slidewaters is short and Lakeside Surf would be no different. Reliability and uptime were of critical importance. "We are only open 100 days of the year which means every day counts," says Bordner. "The equipment, controls, pumps, drives, and motors all need to be able to run with minimal downtime during our busy summers."

Flexibility was another important requirement in the initial design of Lakeside Surf. Bordner attributes the long-term success of Slidewaters to the continued facility investments he and past owners have made over the years and being able to do the same with Lakeside Surf would be key to longevity. "We started big so we'd stay ahead of the market, but we wanted to build in the flexibility to add new wave recipes, adjust old ones and remain relevant as the market grows," says Bordner.

Most of all, however, the wave pool needed to be safe. As a family-focused destination, the wave pool would be accommodating a variety of age groups and had to be compliant with the local department of health and safety. "There are risks, like in any physical sport, but we needed a control system that would ensure our younger staff could operate the wave pool safely and efficiently. E-stops and safety circuits would have to be integrated into the automation and control system to ensure operators could adjust speed or turn it off quickly."

Solution: Engage Applied Motion Systems to design, engineer, and install a fully integrated system of Siemens automation and controls

With Citywave headquartered in Germany, the Bordners sought out a local partner to help with the control upgrades necessary to satisfy the waterpark's requirements, turning to Siemens-certified Solution Partner, Applied Motion Systems (AMS). It's a Washington-based company known for its bespoke motion control systems and specialty machines.

"AMS has a great reputation for forward-thinking solutions and its engineers don't shy away from a challenge," says Robert Bordner.

> *"When we presented all of our requirements, they came back with Siemens as the primary choice for the job."*
>
> Robert Bordner

The surf wave application's design and engineering required twelve identical SINAMICS 132kW drives for a total system rating of 1600 kW. To simplify and reduce the engineering of electrical enclosures and power distribution, AMS selected a pre-fabricated TIASTAR Motor Control Center (MCC) design integrated with the following components:

SINAMICS G120 Drives
The twelve 132kW G120 drives power the same number of 168 HP pumps that produce the necessary water flow to generate a six-foot tall wave, circulating up to a total of 667,000 gallons of water per minute. Siemens Safety Integrated functionality was connected via the PROFIsafe network to enable Safe Torque Off (STO) on each of the drives for emergency shut off.

SIMATIC S7-1500 PLC
As the PROFInet Controller for all devices, the S7-1500 PLC executes all system control including safety logic and motion and wave adjustments in near real time. Using Free Telegrams, the PLC receives additional data from the drives like digital input status, power usage, and fault codes. Modular in design, the SIMATIC PLC provides the flexibility for fast repairs or replacements, plus the ability to increase functionality as Lakeside Surf grows, all without compromising I/O processing time.

SIMATIC ET200SP Remote I/O
The distributed I/O system controls various low power auxiliary motor contactors, providing reliable performance and communication in a small footprint via multifieldbus networks. Channel-specific diagnostic functions and tool-free installation ensure maintenance does not interrupt operations, maximizing the Citywave pool's uptime.

SIMATIC Comfort Panel HMI
The central point of user control for the wave pool was a 12-inch SIMATIC Comfort Panel HMI. AMS configured different user group access levels to separate functionality such as configuration, maintenance, and operation.

SCALANCE Network and Wi-Fi
A secure, industrial Wi-Fi network was set up to allow for the Siemens SmartClient App, a mobile application for remote operation of the SIMATIC HMI system, to securely run on an Apple iPad reserved for operator use. The SmartClient App displays the exact layout of the HMI panel, enabling device operation to be performed as if the users were interacting with the display directly from anywhere in the park.

SIRIUS ACT E-Stop Pushbuttons
The safety integrated solution included low-cost e-stop pushbuttons with enhanced diagnostics in multiple locations at the facility to provide easy access in case of emergency. The multiple pushbuttons were able to be easily wired into the PROFInet network, reducing installation and commissioning time and costs.

SITOP Power Supplies
Providing all DC power required for the system, the SITOP Power Supply's efficiency rating of 96% ensured the wave pool could optimize power usage and prevent short circuiting without compromising or interrupting continuous DC power supplies.

Except for the power supplies and IWLAN Access Point, all devices were configured within a single project in the TIA (Totally Integrated Automation) Portal, a common software engineering framework for full integration of safety, security, control, HMI, drives, motion control and power distribution within a single project, as seen in **Figure 1.**

In doing so, AMS was able to use the built-in SIMATIC S7-1500 automatic generated system diagnostics feature, thus ensuring a consistent reliable diagnostic strategy for the system and any future solutions. The HMI display's SmartClient App allowed for consistent diagnostic visibility for ease of maintenance during operation.

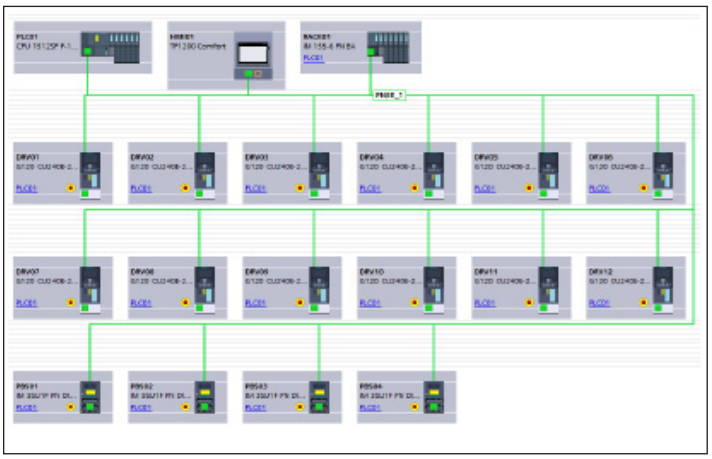
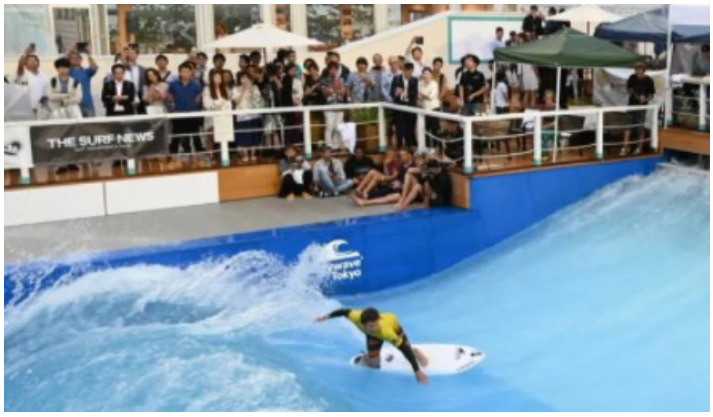


Figure 1

Results: Increased flexibility, safety and performance, in and out of the water

At 50 feet across and 75-feet long with a six-foot high wave, Lakeside Surf is the largest and tallest Citywave wave pool in the world. Completed in 2020, the pandemic hindered its grand opening, leaving the park to quietly open to friends and family for a season of trial runs. "Lakeside Surf became a test bed to really push the Citywave wave pool to the limits and perfect the waves," says Robert Bordner. "We were operating at 15 hours of continuous, full speed with zero issues. It was fantastic."



After an entire summer of testing the Citywave wave pool, Lakeside Surf is ready to welcome visitors in the coming season. Bordner anticipates a 20 percent increase in attendance from the new surf attraction and is readying for a nonstop season. "We can't be in a situation where something goes down for 24 hours in the middle of August," says Bordner.

> *"The reason we went with Siemens was to have something rugged and robust enough to handle the volume and a good reputation of reliability and service."*
>
> Robert Bordner

The upgraded controls system enables Lakeside Surf to deliver an outstanding Citywave experience to every level of surfer. Loaded with wave recipes for beginner, intermediate, advanced, and expert surfers, the user-friendly Apple iPad ensures both flow rate and wave height can be quickly adjusted without stopping use. "The iPad interface is very intuitive, particularly for teenagers. Staff members understand how to use it instantly," says Bordner.

Yet there is still room to grow. The control system was designed to afford Lakeside Surf the flexibility to add new functionality to the wave pool, continuing the company's quest to be "better than expected". "In terms of raw capability, I know we are under-utilizing our controls. At the same time, it means we're positioned to have more options for future growth and functionality," says Bordner. "Since energy efficiency is integrated into the system, we know we will scale sustainably."

The Bordners claim the Citywave wave pool can make a surfer out of anyone. "You might get a few good 'learning' waves out on the ocean, but in our Lakeside Surf Citywave wave pool, you can learn to surf in increments: first at the sidewall, where you can just stand up on the board and establish balance. Then once you have a feel for it, you can jump out on some waves, maybe even try some tricks," says Burke Bordner. "But you get consistently good waves over and over again. There's no striking out on a bad surf day here."

Published by
Siemens Industry, Inc. 2021.

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