



Canyon Hydro

**HYDROELECTRIC SYSTEMS FOR
UTILITIES AND INDEPENDENT
POWER PRODUCERS**



EFFICIENT, RELIABLE HYDROPOWER SYSTEMS

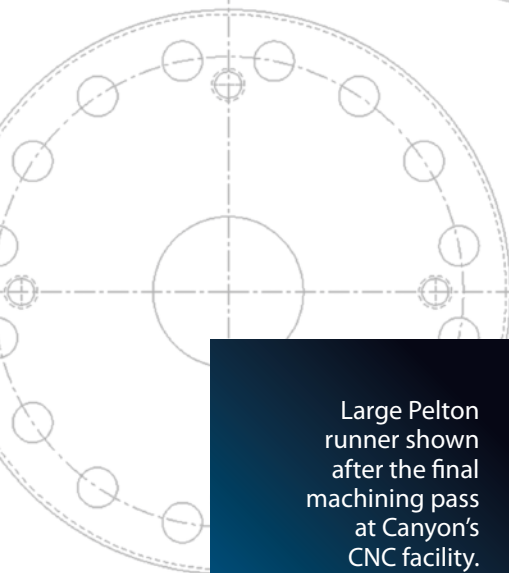
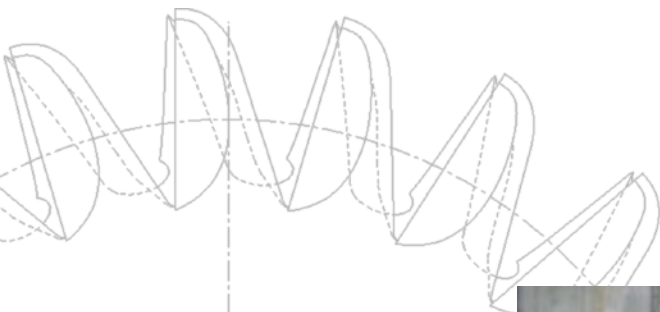
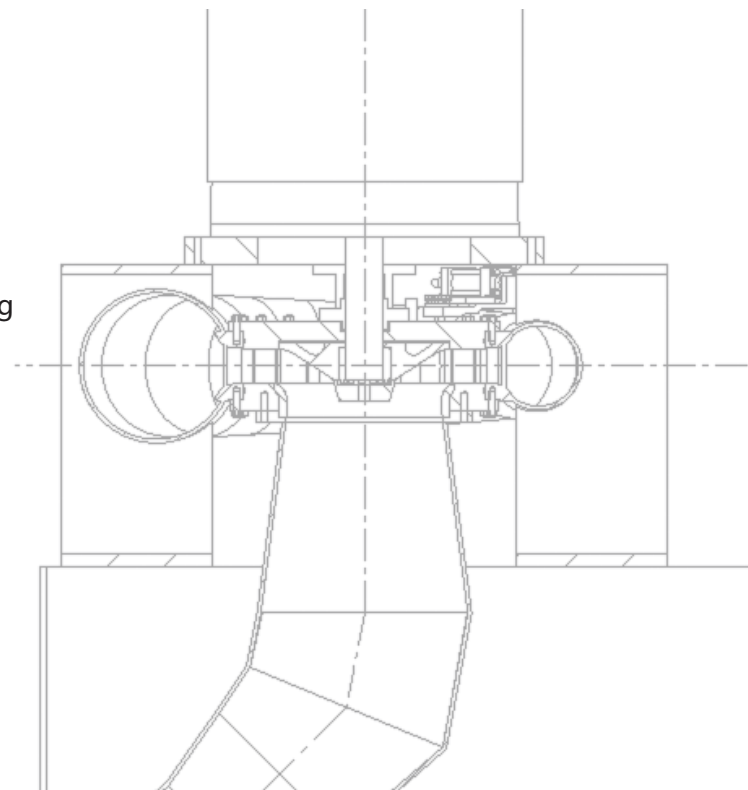
Hydroelectric systems from Canyon Hydro are built to deliver a high return on your investment, year after year.

To meet this objective, the team at Canyon Hydro focuses on three fundamental objectives:

1. Maximum attainable efficiency
2. Long term reliability
3. Expert customer support

For more than 35 years, Canyon has built upon these fundamentals, continually refining designs, manufacturing processes and project expertise.

This long-term dedication to excellence has paid off. Today, the Canyon Hydro brand is one of the most respected in the industry.



Large Pelton runner shown after the final machining pass at Canyon's CNC facility.





EFFICIENCY BEGINS WITH DESIGN

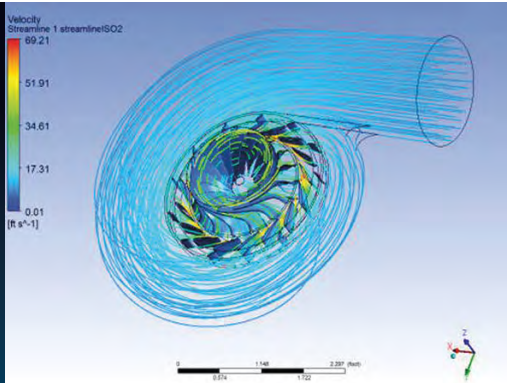
Over the years, turbine designs have become more efficient. Much of this improvement has been driven by more than a century of real-world experience. But recent breakthroughs in digital modeling and computer-driven manufacturing now make it possible to extract even more power from your water.

Canyon Hydro leverages the latest technology to build more efficient turbines, and has continually refined its designs for runners, spiral cases, nozzles, wicket gates and other wetted surfaces. These exclusive designs are then further optimized for each individual project.

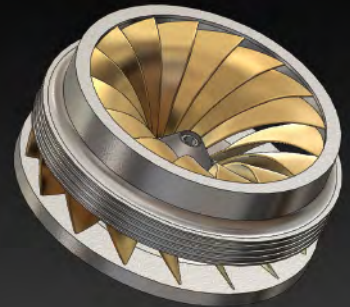
This fine tuning involves the use of advanced, three-dimensional computer modeling and simulation tools, including Finite Element Analysis (FEA), and Computational Fluid Dynamics (CFD). These tools allow Canyon engineers to experiment with small adjustments to bucket or blade profiles, velocities, and other parameters. The digital models accurately predict which combination will extract the most energy from your site. In turn, Hydraulic Transient Analysis helps integrate this design with your overall system.

Canyon turbine design is also influenced by your business objectives. Your Power Purchase Agreement, flow duration curves, and other considerations are used to deliver the highest return on your investment.

Canyon Hydro uses Computational Fluid Dynamics to optimize turbine efficiency. This turbine was engineered to handle wide variations in both head and flow.



Turbine components like this Francis runner are fine-tuned for efficiency using advanced modeling software, then exported directly to CNC machines where the model is replicated in stainless steel.



The La Esperanza project in Honduras uses twin Pelton turbines to produce 12,000 kW from 370 meters (1,214 feet) net head.



FROM MODELS TO METAL

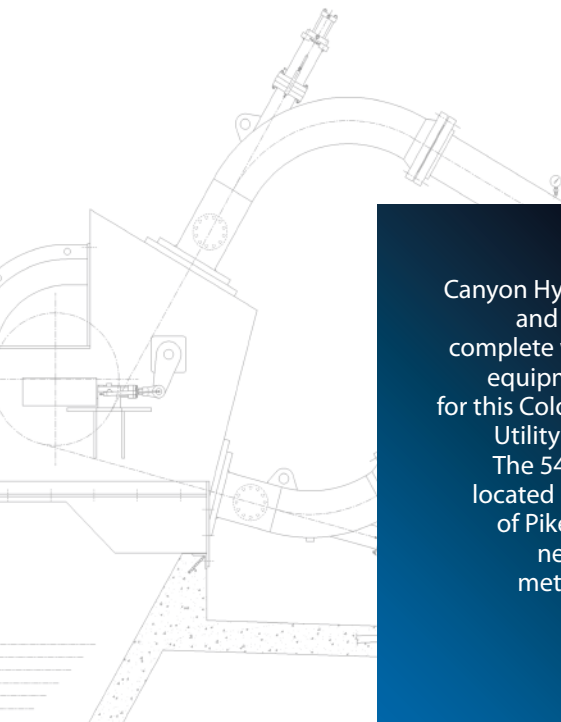
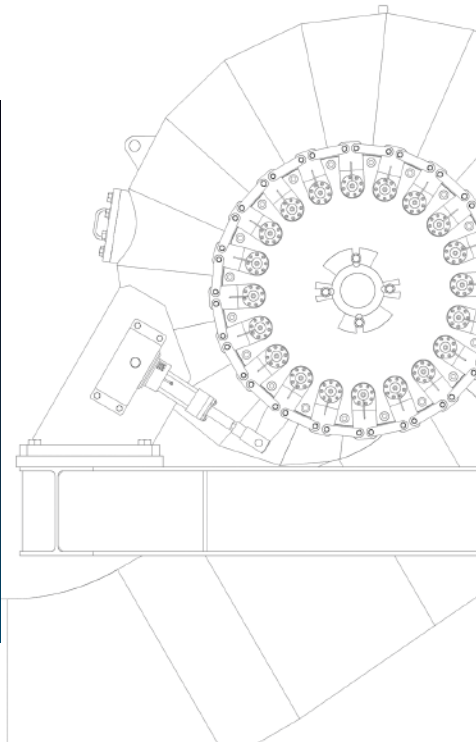
Canyon carries this precision all the way through the manufacturing process, producing an exact replica of the digital 3D model in stainless steel.

Traditional manual grinding lacks the precision necessary to replicate these models. As a result, Canyon Hydro has made substantial investments in computer-controlled manufacturing technology. The carefully tuned runner model is transferred directly into one of Canyon's large-scale CNC machines, where every surface of the model is reproduced exactly as designed.

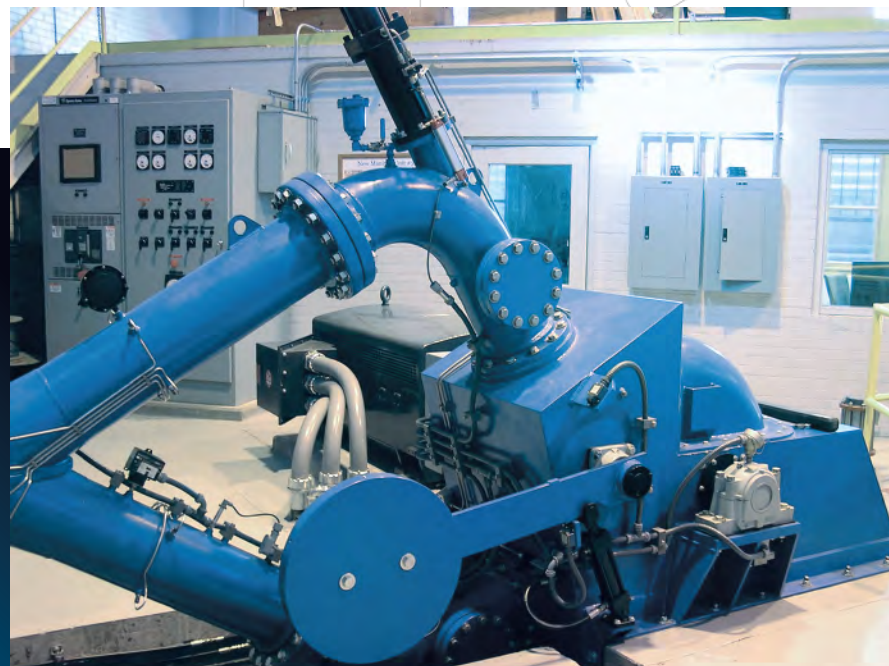
When the computer-controlled milling process is complete, Canyon's finishing team steps in to meticulously polish the runner. This final step virtually eliminates surface turbulence that can reduce efficiency. The resulting hydraulic surfaces are remarkably smooth and confirmed accurate with templates, reflecting a perfect replication of the original model.



CNC Manager Ken Neal inspects a one-piece, 7MW Pelton runner on Canyon's 7-axis CNC mill. The runner has a diameter of 3.4 meters (11.25 feet) and weighs 21,000 pounds. The computerized milling process creates an exact match of the digital model created during design.



Canyon Hydro designed and delivered the complete water-to-wire equipment package for this Colorado Springs Utility powerhouse. The 540 kW system, located near the base of Pike's Peak, has a net head of 209 meters (686 feet).

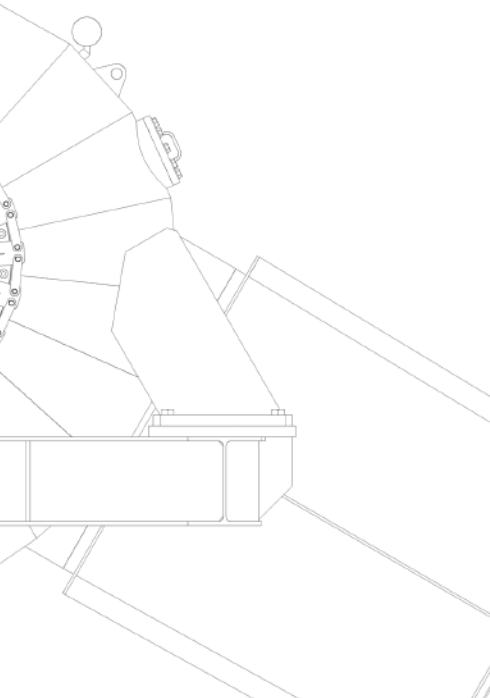




FOCUS ON RELIABILITY

Canyon Hydro turbines are built to deliver utility-grade power for many decades. This long-term durability receives a great deal of emphasis during design and manufacture. All stainless steel alloys, castings, bearings, valves and couplings are premium grade and sourced only from reputable suppliers. Welding is performed by certified personnel, and undergoes rigid quality assurance testing. Pipes and fittings are pressure tested at 150% of operating pressure. Protective epoxy coatings are measured for proper thickness.

The superior quality of a Canyon turbine is easy to see. Close inspection reveals an uncommon attention to detail, reflected in everything from leak-free connections to smooth seams and finishes. From the initial design to the final nameplate, each Canyon turbine exhibits a company-wide commitment to excellence.



Located in Las Vegas, Nevada, this 490 kW Francis turbine replaces a Pressure Reducing Valve (PRV) in the municipal water supply. Operating with a net head of 65 meters (215 feet), the Canyon Hydro system was integrated into an existing vault.



WATER-TO-WIRE PACKAGES

Canyon Hydro can be your single-source supplier for turbines, generators, inlet valves, hydraulics, and other powerhouse equipment.

Proper matching of the turbine and generator is especially important. During the design process, they are simultaneously analyzed for optimum RPM, bearing load, shaft deflection, operating temperature, and other factors. Generators are selected to meet the rigorous demands of hydroelectric environments.

Other components, from embeddable mounting frames to computer-controlled actuators, are carefully selected to integrate with the entire system.

Canyon Hydro supplies water-to-wire systems for grid interconnection, stand-alone operation, or both. For grid systems, controls and switchgear are engineered to meet the inertia requirements and control schemes of each individual project. Canyon also has considerable experience with stand-alone projects for remote communities, and can provide utility-grade governing systems for stable, reliable power.



AN EXPERT TEAM TO BACK YOU UP

A hydropower project is a team effort. Canyon recognizes the importance of this, and has earned a reputation for competent, responsive customer support.

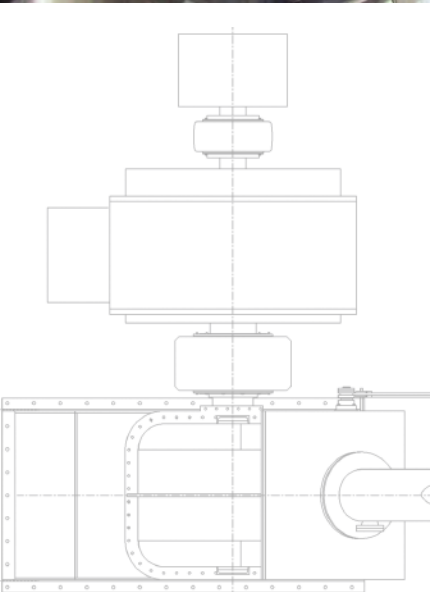
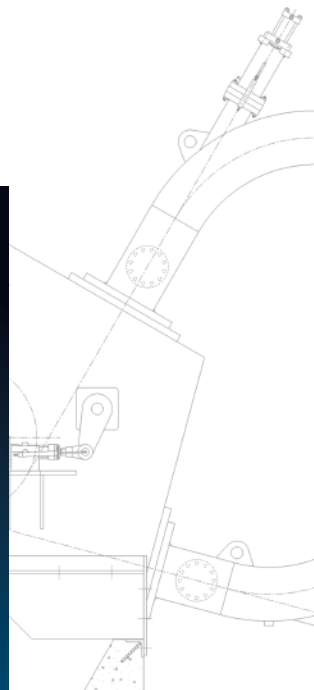
During the design and construction phase, close coordination is critical. The Canyon project team communicates regularly with onsite project engineers and other suppliers to ensure all components and installation teams will work well together.

Canyon's hydropower experts are invaluable during onsite installation. With extensive field experience on a wide array of hydro projects, they can quickly identify potential problems while they are still easy to correct.

Once your system is installed, reliable power production becomes Canyon's highest priority. If your hydro system should fail, recovery takes priority over all other Canyon projects. Replacement parts can be air-shipped and, if necessary, senior engineers will fly on-site to help resolve the problem.



Canyon owner Richard New inspects the runner mounting bolts during installation of a 5MW Pelton system.



Part of a conduit system, this Canyon Hydro Francis-type turbine sits inline with a water supply pipeline for the City of Logan, Utah.



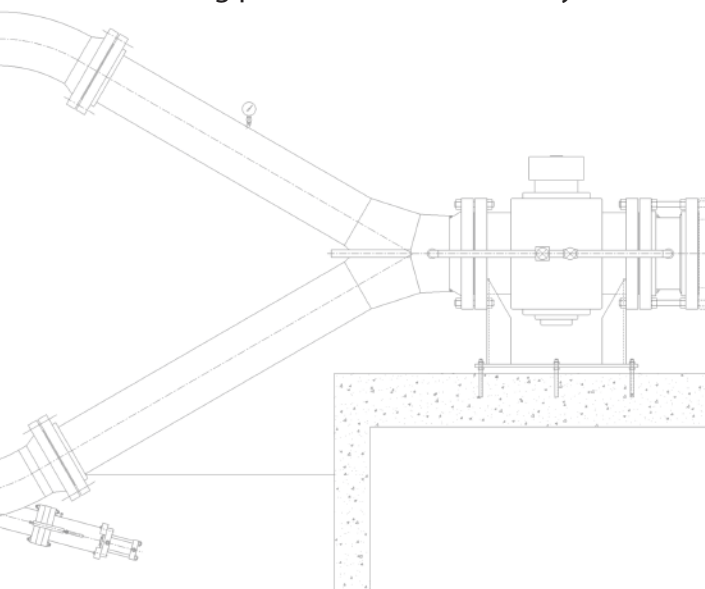


CANYON'S COMMITMENT TO PROJECT SUCCESS

When you acquire a Canyon Hydro system, you are also partnering with a group of highly experienced people, each committed to the success of your project.

Canyon has been building hydropower systems for more than 35 years, and has been involved with hundreds of projects. The Canyon team will work closely with you, assisting with site planning and design, and suggesting improvements or alternatives based on real-world experience. Canyon engineers can help identify ways to accelerate your project, improve efficiency, and increase longevity. Often, they can suggest ways to trim costs without affecting performance or reliability.

For four generations, Canyon Hydro's highly skilled team of professionals has delivered a combination of value, quality and customer satisfaction that is unmatched in the hydropower industry.



Every Canyon Hydro turbine undergoes extensive inspections and non-destructive testing. Here, Canyon Engineer Mike Hansen inspects a Pelton runner destined for a project in California.



ENERGY RECOVERY FROM EXISTING WATER SYSTEMS

Canyon Hydro provides specialized hydropower systems designed to integrate with municipal water systems, irrigation districts and other existing infrastructure. Often called "conduit projects," these energy recovery systems take advantage of the excess pressure developed as water is piped from higher elevations.

These types of projects use a turbine to perform the function of a Pressure Reducing Valve (PRV). While the concept is simple, conduit systems present special challenges. Flow can be highly variable, depending on consumer usage. In many cases pressure must be maintained downstream of the turbine. Penstock surge pressures must be taken into consideration.

Careful site assessment and planning are critical, and it is important to work with a supplier who understands the issues. Canyon Hydro has provided turbines and water-to-wire packages for many different types of conduit projects, and can offer useful advice for those considering an energy recovery system.



INSPECTION, REPAIR & REPLACEMENT

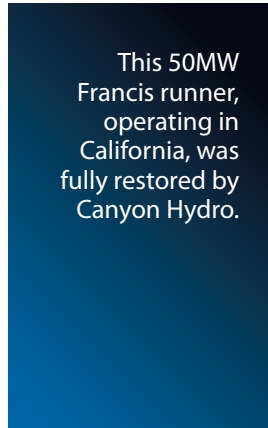
Canyon Hydro has the expertise and machinery to inspect, repair, rebuild, or replace your existing hydropower components, large or small. From onsite mechanicals and line boring to in-plant fabrication and machining, Canyon has the ability to service nearly any turbine project, large or small.

Senior hydro specialists are available to examine the runner and flow control devices (nozzles, wicket gates, etc.) to quickly identify issues. Non-destructive tests, including x-ray and ultrasonic, can detect surface imperfections, hairline cracks and other sources of performance degradation.

All major turbine components can be repaired or replaced by Canyon, including runners, nozzles, wicket gates, and wear rings. Replacement runners are redesigned using Canyon's advanced-technology modeling and machining, resulting in higher efficiency and output than the original design.

For larger systems, Canyon can scan the interior of existing spiral cases and draft tubes to create a digital 3D model of the entire system. This makes it possible to perform a fully integrated CFD analysis and further optimize the efficiency of replacement runners and wicket gates.

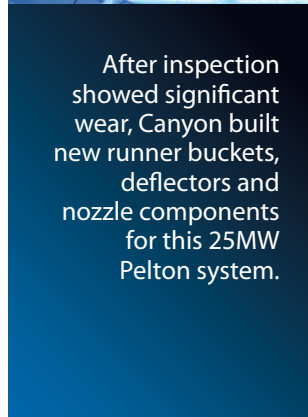
Very large components can be accommodated for fabrication and repair. Canyon Hydro maintains an impressive array of high capacity, precision machinery, including extensive CNC capabilities.



This 50MW Francis runner, operating in California, was fully restored by Canyon Hydro.



Canyon technicians work below a generator stator to prepare line boring for wicket gates. Canyon Hydro provides extensive onsite services such as disassembly & assembly, inspection, machining, and welding.



After inspection showed significant wear, Canyon built new runner buckets, deflectors and nozzle components for this 25MW Pelton system.

For more information about Canyon Hydro, or for a site evaluation and quotation, please contact us:

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