

SELECTED EXPERIENCE - WILLIAM G. WESTGARD, P.E.

Professional Summary

William G. Westgard is owner of Automation & Control Engineering, LLC and has over thirty-two years of experience, including twenty-nine years as an independent consultant, providing customers with professional electrical engineering services, turnkey control systems and the design and startup of motion systems and PLC based controls. Areas of expertise include power distribution, PLC programming, control systems, and design, build and installation of highly accurate and reliable control systems located in hazardous locations, hydroelectric plants, aerospace and nuclear facilities. Other relevant projects include ferry loading systems, hydraulic and pneumatic material handling systems and other various machine controls. Automation & Control Services was founded December 1993 and was incorporated as Automation & Control Engineering, LLC in 2009. The following is a summary of some of the projects I have completed over the span of my career.

USAF Clear Space Force Station PLC Programming

Provided electrical engineering support for NC Power Systems, Tukwila, WA. Used Pac Machine Edition Version 9.8 to program an Emerson RX3i PLC for NC Power for a 4MW medium-voltage load bank at Clear Air Force Station, Clear, AK. The RX3i PLC controls the load bank and is integrated with Emerson RX3i PLC systems in the main plant via TCP/IP Ethernet Communications. The main plant RX3i PLCs control medium voltage switchgear and, seven 3.25MW, 12.47kV CAT generators which are critical to the operation of missile defense radar systems. The permanently installed load bank is used to test the Caterpillar generators.

USAF Launch Complex Hammerhead Crane

50/15 ton Class I, Div II hazardous location bridge crane for USAF Titan rocket Launch Complex - 41 at Cape Canaveral, FL. This mission critical crane was used to assemble Titan rockets. It was one of the first to use line-regenerative vector drives for hoist control. It had multiple control consoles, each with its own GE 90-30 PLC. 21-bit dual resolvers on the main and auxiliary hoists provided highly accurate position data to the PLC system. Specified all the components, including intrinsic safety barriers, nitrogen-purged and airconditioned custom made control panel, motors and other equipment required by the hazardous location. Created all PLC and BASIC language programming and electrical engineering for the system which consisted of five G.E. 90-30 series PLCs on a GE Genius bus network and two co-processors running MegaBASIC on the main CPU backplane that sent ASCII code to HMI control screens on the consoles.

TRW Crane Failure Mode Effects Analysis (FMEA)

Performed Failure Modes Effects Analysis on 50/15 ton USAF payload assembly crane as a consultant to TRW, Redondo Beach, CA. The outcome of this analysis led to hardware and software modifications that enhanced operational safety for this critical application.

Brown and Root Crane Control System Modifications and Startup

Provided startup services and GE 90-30 PLC programming modifications resulting from the Failure Modes Effects Analysis I provided to TRW for the 50/15 ton USAF Launch Complex – 41 crane. This consulting work was provided to Brown & Root at Cape Canaveral, FL.

Schnitzer Steel Whirley Crane Engineering Study

Prepared an engineering study outlining options for upgrading controls for a whirley crane with existing DC field-controls in a motor-generator arrangement. This crane loads ships with scrap steel. The study compares the various options for upgrade, their technical merits, and costs. These options include technical and economic evaluations of a new field-control based system, DC drives, AC drives and motors, common DC bus architecture, new electrification/shore power vs. existing diesel power and line-regen vs reuse of existing braking resistor banks. Provided information gathered from contacts at EPA, Washington Department of Ecology and Puget Sound Clean Air Agency on possible grant money for conversion to shore power. Vendor quotes for equipment and services provided in the report enable accurate assessment of total cost and return on investment for various options. I also provide Allen Bradley SLC PLC programming services for this crane and upgraded the processor to an Allen Bradley SLC 5/05 with TCP/IP Ethernet which enabled connection to the PLC remotely over the internet. The prime mover is a Caterpillar marine diesel which drives independent field-controlled generators, one for each motion.

Alcoa Substation Consultation

Provided consultation to Fluor Global Services / Alcoa on a 13.8kV medium-voltage substation contaminated with PCBs that supplies critical power to the Intalco Works rod shop. Worked with Alcoa personnel and vendors and wrote a report for Fluor/Alcoa outlining options and solutions for their power needs for this part of the plant. Also wrote specifications and coordinated electrical work and new transformer installation for this project.

US Army Pump and Treat Remediation System with SCADA

Electrical Engineer of Record for an environmental pump and treat remediation system at fort Lewis, WA for Battelle Labs and the Army. Responsibilities included complete electrical power distribution and control system design. This PC based (Allen Bradley Soft PLC) "pump & treat" control system pumps water contaminated by an underground plume of TCE solvents to a treatment building. A fiber optic network connects the main control treatment building with the eight pump houses, each of which has local I/O for measuring water levels, flow rates and pressures. Variable frequency drives (VFDs) control the flow rate with positive displacement pumps. Deliverables included all electrical engineering and SCADA programming. The SCADA system display screens (HMI) provides operator interface for the system. The system also created a large database that tracked the automated system's parameters which were stored on the PC and periodically uploaded to other database systems used by the Army for analysis.

Boeing Everett Pump and Treat Facility Electrical Design and Specifications

Engineer of Record for a pump and treat SCADA system for Boeing. Designed all power distribution for the site and new treatment building, prepared fault-current calculations, provided detailed control systems design and wrote related electrical specifications for this new pump and treat facility that removes TCEs from ground water. Deliverables included conduit and wire schedules for the main control house and field stations and all controls systems design. The modular design using fiber optic communications and remote I/O allows for ongoing expansion as required. All well stations are connected only by fiber-optics and three-phase power. This minimizes wiring since all control signals from field stations are communicated to the Allen Bradley Soft PLC in the main control house over the fiber-optic network. Because the distances between pump stations are significant, I worked with Snohomish County PUD to provide medium voltage transformers in two locations to decrease conduit and wire size and minimize voltage drop.

Boeing Everett Pump and Treat Facility Expansion

Provided professional engineering services to expand the Boeing Everett pump and treat system, adding new field stations in underground vaults and increasing main control house processing capacity. Deliverables included all conduit and wire schedules, schematics, equipment specifications and on-site engineering oversight.

Kenworth Siload Motion Control System

Designed a control system and provided all programming and startup services for an automated storage system called the Siload at Kenworth's Renton plant using Red Lion HMI operator interface and an Allen Bradley SLC PLC with serial port cards. The serial cards send ASCII protocol commands to control three existing older two-axes Industrial Devices servo drive systems. ASCII strings are generated and concatenated based on PLC logic and sent to the servo drives. Reusing the existing motion controller/drive units and motors helped Kenworth decrease the cost of the project. The Siload is an elevator system that fetches tools and parts based on the operator's request.

ZPMC Shanghai, China Container Crane Consulting

Container crane engineering oversight included verification of electrical load calculations, control systems design and material selection review for four container (ship to shore) cranes for Westports in the Straights of Malacca. This project included travel to manufacturer's facility in Shanghai, China to assist the customer in evaluation of the construction progress and installation practices.

General Construction Company Graving Dock

Electrical Engineer of Record for a graving dock to be built by General Construction Company at Port Angeles, WA. Responsibilities included complete electrical power distribution and control system design. This facility design consists of an Allen Bradley SLC PLC controlled pump system that controls flooding and dewatering of the graving dock and the main gate which is designed to be water ballasted and locked into place in an open or closed position. Only three phase power and Remote I/O communications were taken to the gate so that the amount of festoon-like cabling connecting the dock and gate could be minimized. Responsibilities also included manufacture, programming and startup of all controls. This project was terminated during construction, prior to completion because of widespread findings of human remains of a burial/religious site.

Scott Dam Control Gate Trolley System

Provided a complete control system including all electrical engineering, Red Lion HMI and Allen Bradley SLC PLC programming and configuration of two Magnetek variable frequency drives for Whiting Crane Services. The system is used to open and close control gates at Scott Dam in California and is critical to dam safety and operations.

Washington State Ferries Terminal Design

Provided electrical engineering consulting services to Washington State Ferries terminal design office on controls and power distribution for passenger and vehicle loading systems. Also provided WSF with peer review of a Square D PLC based loading system for the Friday Harbor ferry terminal.

Flow International Water Jet Controls

As a consultant to Flow International, designed PLC and operator interface software and control system hardware for ultra-high-pressure water jet pumps up to 200HP. Designed hardware and software for a single axis on-the-fly crosscutter that is integrated with a Square D PLC and receives serial protocol setup data from a PC running Wonderware. Hardware and software design of a seven axis slitter and two axis on-the-fly crosscutter that cuts fiberglass using an Allen Bradley 1394 motion system, an SLC 5/04 PLC and a Panelmate HMI operator interface. Designed an abrasive monitoring system for water jet cutting using an Allen Bradley PLC and an industrial PC that runs Labview and records an abrasive levels database to disk in spreadsheet form.

Florida Power Nuclear Containment Building Jib Crane

DC jib crane design and startup. This crane employed DC field weakening/strengthening for speed/torque control and required components, wire and cable appropriate for use in a radioactive environment. The crane was installed in a Florida Power nuclear reactor containment building. Received a week of training on nuclear safety and plant requirements prior to installation.

NASA Canister Rotation Facility Crane

Designed electrical controls for a 100 ton single-failure-proof "canister rotation" crane for NASA. This crane handled the payload canister for the space shuttle. Two-speed AC motors controlled hoist motion and a variable speed DC drive controlled the bridge. The variable speed bridge design maintains vertical pull for constant speed hoisting during rotation.

Boeing Aircraft Splice Tools

Provided Boeing with two six axis turnkey splice systems. The scope of these projects included system design and build, power distribution coordination with Boeing, all electrical drawings, and a complete operations & maintenance manual. This system runs Allen Bradley's Graphical Motion Language and is used to splice the two halves of the F/A-18E/F Super Hornet together. Additional programming and hardware modifications provide LVDT position feedback that gives Boeing faster and safer airplane assembly.

Hartford Engineering Oil Well Service Rig

Provided electrical engineering services for power distribution design and electrical controls for an oil well service rig in Siberia. Specified a new 569kVA diesel generator and variable frequency drives (VFDs). The generator is designed to supply power for the drives and can also be used as a supplementary power source.

Robbins Company Tunnel Boring Machines

Provided Allen Bradley PLC5, Mitsubishi PLC, Factory Link and Panelmate HMI programming for control systems on several boring/mining machines for The Robbins Company in Kent, WA. These machines are used in large tunneling construction projects.

Boeing Charleston Overhead Cranes Design Review

Worked with Boeing representatives, structural/mechanical consultants and the crane manufacturer and provided electrical design review services for Boeing Charleston's overhead crane systems in the 787 manufacturing plant. Reviewed design at various levels of completion stages and provided suggestions for breaker coordination, power and controls drawings, PLC programming and equipment usage and selection.

Retractable Pontoon Bridge Controls

Provided Manson Construction with an on-site control system review and motor control troubleshooting services on the Ford Island Bridge at Pearl Harbor. This retractable pontoon bridge connects Ford Island with Oahu and is critical for opening for naval vessels.

Gorge Dam Powerhouse Bridge Crane

Designed, supplied and commissioned a crane safety monitoring system for a powerhouse crane at the Gorge Dam. The system monitors the crane operation and position and displays information to the operator.

Scan American Packaging Machine

Provided programming services using Pac Machine Edition Version 9.8 for Scan American for a small G.E. VersaMax PLC system that controls the packaging of spices for a wholesale foods manufacturer.

PLC Machine Controls

Provided G.E. VersaMax PLC programming services for an automated machine that produces bacteria test strips.

General Information and Experience

Professional Electrical Engineering Services - Power distribution and control system design engineering services. Engineering studies and specifications for a wide range of applications. Design techniques for radioactive environments and hazardous locations including purging, isolation, and explosion-proof enclosures. FMEA analysis, electrical noise abatement techniques, energy savings analysis. Turnkey control systems.

Languages and Software - RSView32, SoftLogix, GML, Factory Link, BASIC, Fortran. PLC Programming - Allen Bradley PLC5, SLC500, SLC150 Processors, Texas Instruments 565, 530T Processors, Mitsubishi FX, AnS series+ Processors, GE Fanuc 90 series, series1+ Processors, Modicon 184-984 Processors, Square D, PLC Direct Idec and others. Motion Control - Siemens SIMOTION and S7 PLC, Galil, Kollmorgen, Pacific Scientific, Fenner, Compumotor, Emerson, Allen Bradley.

AutoCAD - Production of all drawings required for a given project including electrical schematics, panel layouts, interconnection diagrams, site plans, C&W schedules, conduit arrangement, etc.

Drives and Motors - Selection, integration and specification of Siemens, Yaskawa, Baldor, Mitsubishi, Allen Bradley and Kollmorgen drives and AC squirrel cage, AC vector duty, wound rotor, DC, brushless DC and stepper type motors, pneumatics and hydraulics. Also, "old-school" controls such as Synchro-ties, Amplidynes, M-G sets and constant-potential DC controls commonly found on cranes, bridges and other machinery.

Sensors - Magnetic proximity, photoelectric sensors, radar level detection, LVDTs, RTDs, thermocouples, limit switches, etc. System Parameters - Mechanical and electrical calculations necessary to define and verify machine design and motor sizing.

Instrumentation - Pressure, flow and temperature transmitters, differential quadrature encoders, tachometers.

Education - B.S., Electronics Technology from Indiana State University, 1986

Continuing Ed - Arctic Regions Engineering Short Course, January, 2005
Emerson PLC Logic Developer Controller Programming, July 2022

Licensing - Professional Engineer, Electrical - WA (# 33298), AK (# 11167), OR (# 88870PE), MT (# 30657PE), ID (# 15869), CA (# 22086)
NCEES Records facilitate expedient licensing in additional states

Affiliations - Senior Member IEEE, Industrial Applications Society

United States Patent - # 9,484,148 Inductive (wireless) Power Transfer for Ground-Based Machines