Matthew Harper

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EXECUTIVE SUMMARY

Engineering and technology leader experienced in leading cross-functional teams delivering scalable, reliable, and mission-critical solutions. Strong background in onshore/offshore electrical engineering, instrumentation, industrial automation, reliability-centered maintenance (RCM), asset integrity, operations, and applied AI/ML. Proven experience improving equipment reliability, operational availability, and production performance through engineering innovation, root cause analysis, predictive maintenance, and data-driven optimization. Strong industrial field experience with advanced engineering and technology leadership, bridging the gap between theoretical concepts and practical, real-world solutions. Experienced in exploration, research, and development of new emerging technologies.

ENGINEERING, RELIABILITY & TECHNOLOGY LEADERSHIP

- **Developed Autonomous Production & Smart Field Systems** for Surge Energy delivering 5.2% production improvement, 7.3% availability gains reducing daily alarms from more than 30 to less than 4 per day.
- **AI-Driven Reliability & Predictive Maintenance** increasing asset MTTF greater than 40–50-year horizons and reducing failure rates enterprise-wide.
- **Mission-Critical Systems Innovation** improving network reliability from 70-year to 858-year MTTF for aerospace launch reliability, safety, and operations for fault tolerant and self-healing operation.
- **Enterprise Analytics & Decision Platforms** enabling real-time situational awareness and decision-making featuring production and operations dashboards for real-time situational awareness.
- **Novel Invention for Gas Injection Optimization** utilizing stochastic optimization and gradient descent for injection utilizing adaptive learning rates with random walks for regional search and local refinement.

FEATURED AI/ML & COMPUTER VISION PROJECTS

Integrated AI & RCM-Based Operations & Maintenance Practices (GitHub) **LINK**
Computer Vision Based Rocket-Launch Monitoring (GitHub) **LINK**
Industrial AI Asset Monitoring with HSV Induced Segmentation (GitHub) **LINK**
Multimodal AI - Vision Language Models Using CLIP for linking Text and Images (GitHub) **LINK**

PROFESSIONAL EXPERIENCE

Independent Consultant | Electrical, Instrumentation, Automation & Applied AI/ML| 2024–2026

- **Presented independent expertise** in electrical power systems, instrumentation, industrial automation, data analytics, and AI/ML across aerospace, oil & gas, petrochemical, and mission-critical operations.
- **Advised engineering teams** on technology strategy, digital transformation, AI/ML implementation, system modernization, and scalable automation solutions, bridging the gap between theoretical engineering concepts and practical industrial applications.
- **Prepared technical presentations** and engineering demonstrations with detailed system architectures to demonstrate complex engineering principles and practical implementation strategies to technical and leadership audiences.
- **Utilized multidisciplinary engineering expertise to bridge the gap** between theoretical concepts and practical industrial applications, identifying opportunities to improve reliability, efficiency, operational performance, and technology adoption.
- **Developed data-driven engineering solutions** integrating real-time sensor data, industrial IoT, computer vision, cloud infrastructure, and machine learning models with operational technology (OT) systems.
- **Leveraged statistical modeling, stochastic optimization, reliability engineering**, and advanced analytical techniques to transform operational data into actionable insights that improve asset utilization, reduce downtime, and maximize business value.

Automation Engineering Lead | Production Facilities & Asset Reliability | Surge Energy (2021–2024)

- **Led engineering and deployment** of scalable autonomous production systems, integrating PLC/DCS/SCADA, instrumentation, edge computing, operational data platforms, and AI/ML while aligning solutions with corporate IT/OT governance and standards.

- **Led development of emerging-technology and data-driven optimization initiatives** that **increased production 5.2%** and improved facility **availability 7.3%,** reducing alarms from more than 30 to less than 4 alarms per day and improving real-time operational decision-making .
- **Deployed AI/ML-driven reliability and condition-based maintenance solutions**, including anomaly detection, predictive analytics, Remaining Useful Life (RUL) models, and real-time equipment monitoring to increase MTTF/MTBF and reduce unplanned downtime.
- **Led multidisciplinary electrical RCA investigations** involving switchgear, MCCs, VFDs, motors, instrumentation, controls, protective devices, grounding, and power-distribution failures, translating findings into engineered corrective actions, reliability improvements, and updated design/maintenance standards.
- **Led process-safety, electrical-safety, and reliability initiatives,** including risk assessments, PHAs, shutdown-system performance, failure analysis, alarm reduction, and engineered mitigations to reduce probability of failure and unplanned shutdowns.
- **Automated production measurement, material balancing, and custody-transfer workflows,** supporting meter-factor management and compliance with API MPMS and TRRC requirements.
- **Provided technical leadership for electrical power, instrumentation, and control-system engineering,** developing electrical/I&C design basis, specifications, drawings, equipment requirements, construction packages, and operating standards for new and existing production facilities.
- **Engineered industrial electrical power systems** including utility/service interfaces, transformers, switchgear, MCCs, VFDs, motors, generators/backup power, distribution panels, protective devices, and associated control and instrumentation interfaces for production facilities and well pads.
- **Engineered grounding and bonding systems for industrial facilities**, evaluating equipment grounding, ground grids/electrodes, instrumentation and control-system grounding, shielding, surge protection, and lightning-protection interfaces to mitigate personnel hazards, transient events, noise, and equipment damage.
- **Led electrical system studies, troubleshooting, and root-cause analysis (RCA)** for equipment failures, nuisance trips, power-quality issues, grounding deficiencies, and electrical/control-system events; developed corrective actions to improve reliability, availability, and personnel/equipment safety.
- **Developed and reviewed facility grounding, bonding, and lightning-protection designs,** including grounding electrode systems, equipment bonding, surge protection, instrumentation grounding/shielding, and protection of sensitive control, communications, and electrical equipment in industrial environments.
- **Directed complete project lifecycles from concept through startup,** managing engineering, vendors, contractors, construction, FAT/SAT, commissioning, troubleshooting, mechanical completion, testing, turnover, and final activation of electrical, instrumentation, and automation systems.
- **Directed development and deployment of autonomous PLC/SCADA control systems** including Smart Lift, Smart Tank, Smart Level, and Tankless Battery applications, reducing manual intervention and improving production efficiency, reliability, and operational safety.
- **Managed multidisciplinary engineering teams, vendors, and contractors** while mentoring engineers and analysts through technical reviews, engineering standards, governance, and structured knowledge transfer.

I&E Engineering Lead (Consultant) | Vandenberg, CA AFB/SFB | Firefly Aerospace (2021-2021)

- **Led design and commissioning of mission-critical** electrical power, automation, instrumentation, and control systems for launch operations.
- **Managed active Area Warning System (AWS)** which served as the site safety alert notification system providing Space Launch Complex 2 (SLC-2) at Vandenberg AFB, CA with a site wide hazardous communication alert system complete with robust audible and visual signals.
- **Led electrical power engineering for mission-critical launch infrastructure**, including facility power distribution, switchgear, transformers, MCCs, UPS/backup power, control panels, and electrical interfaces supporting launch, instrumentation, communications, and ground-support systems.
- **Developed and reviewed grounding, bonding, surge-protection, and lightning-protection designs** for launch and instrumentation systems, addressing personnel safety, equipment protection, signal integrity, electromagnetic interference, and reliable operation of sensitive control and communication equipment.
- **Lead network architect for high-availability networking and timing systems** with triple redundant precision time protocol (PTP) satellite timing network utilizing GNSS/GPS pulse per second (PPS) Master Clock Time Synchronization System (MCTSS) for all timing operations and interface with range operations at Vandenberg Air Force Base which met or exceeded the general design policy 3.2.1 of AFSPCMAN91-710 for system failure with catastrophic hazards.

- **Directed electrical installation, inspection, testing, and commissioning** of launch-facility electrical systems, verifying equipment, wiring, grounding, protection, controls, and interfaces against engineering requirements, safety standards, and range/mission requirements.
- **Developed Analytics & Decision Platforms** enabling real-time situational awareness and faster executive decision-making featuring production and operations dashboards for real-time situational awareness.
- **Provided technical guidance for launch complex projects** ensuring compliance and alignment of Space Force range safety standards, launch requirements, and mission objectives.
- **Managed strategic alignment of resources with cross-functional teams** ensuring designs met project scheduling, costs, safety, reliability, maintenance, and operational requirements.

Sr. Automation Engineer | Automation & Electrical | Oxy (2018–2020)

- **Performed functional-safety and reliability engineering for BPCS, IPLs, and safety-critical systems**, applying PFD, TMEL, MTTF/MTTR/MTBF and failure-mode analysis to improve system reliability by more than 100X while reducing operational downtime.
- **Led electrical and control-system troubleshooting and root-cause analysis (RCA)** of equipment failures, nuisance trips, process shutdowns, network faults, and instrumentation/control anomalies, implementing corrective actions to improve availability and reliability.
- **Designed autonomous PLC-based artificial-lift and well-production control systems**, applying stochastic optimization, gradient-based methods, backpropagation, and ML-driven decision logic to optimize production and safely respond to process deviations.
- **Provided technical leadership for electrical power, instrumentation, automation, and control-system engineering** supporting well sites and production facilities, integrating safety, reliability, maintainability, operability, and lifecycle requirements into engineering designs.
- **Developed electrical design packages for oilfield production facilities**, including one-line diagrams, switch-rack layouts, underground electrical systems, cable schedules, equipment specifications, arc-flash studies, electrical labeling, and installation requirements.
- **Engineered and specified UPS and DC battery systems**, including load/demand analysis, required backup duration, battery sizing, testing, and validation to maintain critical control, instrumentation, and communications systems during loss of normal power.
- **Designed and modernized industrial OT/IoT networks for BPCS and independent protection layers**, integrating fiber, wireless, industrial DMZs, physical firewall segmentation, self-healing architectures, and fault-tolerant topologies across 200+ facilities.
- **Engineered Fire & Gas hazardous-area detection systems**, including IPL/SIF requirements, inspection and test plans, and toxic/flammable gas monitoring for H2S and high-LEL gas environments.
- **Developed advanced alarm-management strategies** using FMEA-based rationalization/grouping, dynamic prioritization, and multivariable techniques to reduce nuisance alarms, improve operator response, increase uptime, and strengthen process safety.
- **Provided technical leadership and mentorship across engineering, operations, maintenance, and project teams**, guiding design reviews, technical standards, knowledge transfer, commissioning, troubleshooting, and lifecycle execution.
- **Designed and led wireless IOT design and zone-based segmentation** & security for layers 1-3 including fiber-based automation network architectures for BPCS and IPL layers of protection, performing detailed safety and reliability analysis (PFD, TMEL, MTTF/MTTR/MTBF) and demonstrating greater than 100X reliability improvement while reducing downtime.
- **Led large-scale network modernization initiatives**, including hot cut-over transition of 200+ facilities from 2.4 GHz wireless to fiber-optic inter-connected industrial DMZ networks, implementing self-healing topologies, physical firewall segmentation, and single-fault-tolerant (1oo2+) designs, achieving TMEL greater than 1E-3 and cut-over failure rates lower than 0.009.
- **Developed and implemented advanced alarm management philosophies** using FMEA-driven grouping, dynamic prioritization, and multivariable alarm techniques, significantly reducing nuisance alarms, improving operator response to safety-critical events, increasing production uptime, and reducing operator workload.
- **Managed project life cycles**, from requirements to FAT/SAT testing, commissioning, mechanical integrity, and operational handover.

Electrical Engineer | $7B Cedar Bayou Expansion Project | Chevron Phillips (2015–2018)

- **Lead Operations Engineer for electrical, instrumentation, and control systems on the ~$7B USGC 1594 Cedar Bayou ethane cracker expansion**, leading engineering design, technical assurance, operational readiness, SOP development, training, commissioning, and mission-critical operations.

- **Led Electrical and Instrumentation Mechanical Integrity and Reliability-Centered Maintenance programs**, applying equipment criticality, FMEA, RCA, condition-based monitoring, predictive data, and adaptive maintenance strategies to improve asset reliability and lifecycle performance.
- **Led electrical power-system engineering and design for large-scale petrochemical facilities**, including power distribution, switchgear, MCCs, transformers, motors, protective relaying, control power, and associated instrumentation and control interfaces.
- **Performed electrical power-system studies using ETAP**, including load flow, short-circuit, arc-flash, motor-starting/trip-characteristic, and protection evaluations to support equipment design, system coordination, personnel safety, and reliable plant operation.
- **Engineered protection and control schemes for large rotating equipment, turbines, and electrical distribution systems**, developing SEL relay settings and logic using acSELerator, zones of protection, motor-start protection, trip schemes, and integration with plant Power Management Systems.
- **Designed and supported real-time electrical power monitoring and diagnostics**, integrating SEL relays and intelligent electrical devices over TCP/Modbus and fiber-optic networks for remote monitoring, event analysis, condition assessment, and reliability improvement.
- **Led switchgear testing, commissioning, maintenance, and electrical switching activities**, applying ANSI/NETA requirements and developing procedures supporting safe energization, startup, troubleshooting, and lifecycle operation of critical electrical infrastructure.
- **Led functional-safety engineering for ID/FD fans, steam turbine boilers, furnaces, and burner-management systems**, developing safety requirements, control/interlock narratives, permissives, trips, and shutdown functionality in accordance with NFPA 85 and ANSI/ISA 77 requirements.
- **Served as SME for alarm management, SIS diagnostics, and IPL/SIF identification**, integrating process-safety requirements with DCS, PLC, Triconex, instrumentation, and electrical systems to improve operational safety and availability.
- **Led FAT/SAT, loop checks, commissioning, troubleshooting, and operational-readiness activities** across ControlLogix, Yokogawa CENTUM VP, Triconex, SEL, Honeywell, and FOUNDATION Fieldbus systems, ensuring design compliance and successful unit startup.
- **Provided multidisciplinary technical leadership across engineering, EPC contractors, operations, and maintenance**, resolving design and contract-exhibit requirements while ensuring electrical/I&C systems met safety, reliability, maintainability, constructability, and operational objectives.

Electrical Engineer | Launch & Test Infrastructure | SpaceX (2014–2015)

- **Led end-to-end electrical, instrumentation, automation, and controls engineering at SpaceX's McGregor Rocket Development Facility**, spanning utility power and facility distribution through switchboards, MCCs, motors, instrumentation, industrial networks, PLC/SCADA programming, commissioning, operations, and maintenance.
- **Designed and commissioned deep-cryogenic LOX propellant densification and conditioning systems** supporting reusable launch-vehicle development, integrating LN2-based thermal conditioning, cryogenic heat-transfer equipment, storage/transfer systems, instrumentation, electrical power, and autonomous controls to produce and maintain subcooled high-density LOX.
- **Developed autonomous PLC control and safety sequences for cryogenic propellant systems**, integrating pressure, temperature, level and flow instrumentation; control valves and actuators; permissives, interlocks and shutdown logic; and real-time SCADA/HMI monitoring for LOX, LN2, LNG and RP-1 operations.
- **Engineered cryogenic thermal-management and recirculation processes** to control propellant temperature, pressure, density, and boil-off during conditioning, storage and transfer, supporting repeatable high-performance rocket-engine and vehicle testing.
- **Served as Lead Electrical Engineer for SpaceX's first mission-critical data center in Texas**, leading electrical power architecture, distribution, UPS, standby generation, automatic transfer, monitoring/control integration, commissioning, and operational readiness for critical compute infrastructure.
- **Engineered mission-critical electrical power distribution from utility/service entrance through point-of-use loads**, including transformers, switchboards, MCCs, motors, VFDs, generators, UPS/ATS systems, distribution panels, control power, protective devices, and supporting facility infrastructure.
- **Led electrical design and field engineering for rocket test stands, launch-support systems, commercial facilities, and site infrastructure**, providing equipment specification, construction support, installation, commissioning, operations, maintenance, troubleshooting, and system modifications.

- **Developed autonomous PLC/SCADA systems for rocket-engine and vehicle test stands**, programming control sequences, permissives, interlocks, safety functions, HMI/GUI applications, data acquisition, and real-time monitoring for mission-critical test operations.
- **Designed and integrated electrical and instrumentation systems for cryogenic and high-energy applications**, specifying sensors, transmitters, control valves, actuators, panels, wiring, communications, and control interfaces for pressure, temperature, flow, and level measurement and control.
- **Performed electrical and controls troubleshooting, failure analysis, and root-cause analysis (RCA)** across power distribution, rotating equipment, instrumentation, PLC/SCADA, cryogenic systems, and facility infrastructure, implementing corrective actions to improve reliability and test availability.
- **Led operations and maintenance of mission-critical electrical, automation, and cryogenic infrastructure**, providing hands-on troubleshooting, preventive/corrective maintenance, commissioning, modifications, and operational support in a high-tempo rocket-development environment.
- **Managed capital engineering projects supporting Falcon Heavy, Raptor, Crew Dragon, and Merlin Stage 1/Stage 2 test infrastructure**, coordinating electrical, mechanical, instrumentation, automation, construction, commissioning, operations, safety, cost, and schedule requirements.
- **Implemented reliability-centered maintenance and electrical/mechanical integrity practices** using NASA RCM and mission-assurance principles to improve equipment reliability, maintainability, fault tolerance, and operational readiness.

Adjunct Faculty | Electrical, Instrument & Automation | San Jacinto College (2012–2014)

- Taught concepts in instrumentation, process control, PLC programming, and automation systems to technology students.
- **Developed course instruction and labs materials** which reinforced lectures in electrical theory and controls, principles of instrumentation, PID control theory and tuning, DCS/PLC programming, and automation theory & systems to technology students.
- **Lectured course topics and presentations** featuring in-depth and practical examples bridging the gap between theoretical and real-world solutions
- **Developed training & educational curriculum**s which integrated theory with hands-on industrial applications.

Onshore/Offshore Electrician | I&E Technician | Supervisor

Approximately 10 years of hands-on electrical and instrumentation experience supporting major U.S. industrial construction projects and operating facilities both onshore and offshore platforms. Performed and supervised electrical and I&E construction in the US and abroad in Middle East. Installation, testing, commissioning, troubleshooting, maintenance, and operations, providing the field foundation for subsequent electrical engineering, automation, project leadership, and engineering-management roles.

EDUCATION

MS, Data Science – *Texas A&M University - Victoria*
MS, Computer Science – *University of Houston - Victoria*
BS, Electrical Engineering – *Texas A&M University*
AS, Mathematics – *San Jacinto College*
AAS, Instrumentation Technology – *San Jacinto College*

CERTIFICATIONS & TRAINING

UH Data Analytics & Machine Learning Certificate – AI/ML Based Well Optimization
ISA 84 SIS Expert
*Texas Master Electrical License (**TMEL**)*
*NFPA Certified Electrical Safety Expert (**CESP**)*
*NCCER Certified Instrument Technician (**NCIT**)*
*Certified Fieldbus Technical Specialist (**CFTS**)*
Certified Honeywell Field Device Manager Programming Associate
*DHS Industrial Cyber Emergency Response Team (**CERT**) Certificate*

HONORS & AWARDS

***Top Graduate Award** - University of Houston-Victoria*
***Technical Innovation Award** – Surge Energy, Smart Systems*

Thanx Award *– Innovation and Dedication – Oxy, New Mexico*
Kick Ass Award *- SpaceX, McGregor Test Site*
Electrical Design Project *– Texas A&M University*
Phi Theta Kappa *- Honor Society*
Phi Kappa Phi *- Honor Society*

HIGHLIGHTS & IMPACT

- Highly experienced delivering **PLC-integrated, high-reliability systems** in energy, aerospace, and AI research.
- Led teams of engineers and developers, **mentoring junior engineers into technical leaders**.
- Successfully executed projects improving **automation reliability, CI/CD processes, and system performance**.
- Deep expertise applied **AI/ML**, and large-scale engineering systems aligned with a focus on innovation in AI computing.
- **Hands-on** domain level experience in electrical, instrumentation, automation, and programming.

PROJECTS

- **Electrical** Aerospace, Data Center, Industrial, Chemical, Oil & Gas, Offshore, Manufacturing
- **Aerospace** Rocket Launch and Testing design, Instrumentation, Engineering and Operations
- **Automation** CI/CD Development Testing, Commissioning, Maintenance, Operations
- **Petrochemicals** Cedar Bayou $7B US Gulf Coast (**USGC**) polyethylene
- **Multimodal** based AI vision transformer models used for process optimization and rationalization using CLIP with image and text encoders.
- **Embedded AI based** autonomous well monitoring Smart Lift gas injection optimization project.
- **Agentic AI** Smart Tank project in which autonomous monitoring and control utilized for dynamic PVT monitoring and dynamic set point and control adjusting in real-time to increase production and increase safety and reliability.
- **Intelligent Agent** development project deployed to identify product bottlenecks, abnormalities, material balancing, and self-generated or generative rule generation for pattern recognition.

CORE SKILLS

- **Reliability & Asset Integrity**: Reliability-Centered Maintenance (RCM), Root Cause Failure Analysis (RCFA/RCA), Failure Modes and Effects Analysis (FMEA), Mechanical Integrity, Equipment Criticality, Condition-Based Monitoring (CBM), Predictive Maintenance (PdM), MTBF, MTTR, MTTF, Asset Availability, Electrical & Instrumentation Reliability, Process Safety, and Reliability Improvement.
- **Automation**: Yokogawa, Rockwell RSLogix 500, Controllogix 5000, Modicon, Siemens, Beckhoff TwinCAT3, GE Fanuc, Triconex TS32, Texas Instruments C2000 Piccolo, Arduino Uno w/Ethernet card, Emerson DeltaV, Honeywell Experion & Safety Manager, OSI PI, IP21, Smartphone Google Android application programming, real-time digital watermarking.
- **Network**: TCP/UDP, APIs, Ethernet, Fieldbus, HART, Profibus, Modbus, fiber optics, Device net, DH+, DH485, RS232/422/485, Network Address Translators (NATs), MOXA NPort serial device servers, Ethernet-to-fiber converters (single/multi modes), Wireshark, Cisco Switches/Routers.
- **VFD**: Allen Bradley Power Flex, Omron, Siemens, Baker Hughes, Schneider, Toshiba, Texas Instruments Piccolo.
- **DAQ**: National Instruments SCXI, PXI, PCI, Fieldpoint modules DSP Texas Instruments C6748.
- **HMI**: Rockwell FactoryTalk, Allen Bradley PanelView, Invensys Wonderware, Modicon, DeltaV, Honeywell, National Instruments Labview, Yokogawa, PyQT, C++.
- **Programming**: C, C++, C#, R, Python, Java, Visual BASIC, VB.NET, DOS, Linux, SQL, Ladder Logic, Function Blocks, Sequential Function Chart, and Structured Text. Web Interpreters Jupyter Notebook, Colab, Visualization – Tableau, Spotfire, Matplot.

- **AI/ML Engineering**: Deep Learning Models (CNN,RNN,LSTM), Data Mining, Data Analytics, NLP and LLMs, Computer Vision, Image Recognition, Classification, Regression, Time-Series Models, ANNs, Decision Trees, Random Forest, Logistic Regression, Clustering, Predictive Analytics, Semantic Analysis, Artificial Process Control and Artificial Alarm Analysis
- **Libraries**: TensorFlow, PyTorch, Keras, Pandas, NumPy, Scikit-learn, MLflow, MLOps, AIOps, LLMs, BERT, GPT, CLIP, RAG, Nvidia NeMo toolkit for automatic speech recognition (ASR), Matplot, PySpark, Seaborn, Beautiful Soup, OpenCV, SciPy, Theano, MLflow, and Streamlit data visualization.
- **Compilers**: Texas Instruments TMS320C55x Optimizing C/C++ Compiler, NI LabView, Microsoft VisualStudio, Android Studio for Android Development. Additional Modeling and simulation experience with PSpice, Matlab Simulink. Code Composer Studio for TMS320C6748 DSP (Texas Instrument C6748), Jupyter Notebook.
- **Engineering**: exSILentia, AutoCAD, MathWorks MATLAB, SmartPlant, ETAP, SKM, PHAWorks/Pro, Altium PCB designer, CMMS, AMS.
- **Software & Cloud:** SCADA, PLC, RTU, DCS, Python, Linux, Bash, C++, SQL, cloud infrastructure (GCP, AWS, Azure), CI/CD, API design, Kanban, ML/AI workflows such as Databricks MLflow, Docker, Tableau.
- **Leadership & Management:** Team leadership, talent development, mentoring junior engineers, cross-team collaboration, engineering governance, knowledge transfer and sharing.
- **Pipelines:** Apache Spark, Hadoop, Pandas, Streamlit, Colab, Jupyter
- **Project Lifecycle:** construction → installation → commissioning → startup → operations → maintenance → reliability → engineering/design → automation → optimization/AI → engineering leadership.