

This is **FPS**





THE COMPANY

In February 2022, **Fossil Power Systems (FPS)** became part of the Babcock & Wilcox (B&W) family of steam generation and emissions control technologies. The acquisition is a natural extension of the long relationship the two companies have had for more than 35 years when B&W began serving as the exclusive supplier of FPS ignitors in the U.S.

Founded in 1981 as a designer and manufacturer of ignitors, flame scanners and drum level probes, FPS has evolved to become a worldwide leader in the design and manufacture of firing equipment and safety systems for the power generation, pulp and paper, and petrochemical industries.

FPS developed many of the technologies that are currently being used throughout the industry on flame scanning, gas/oil ignition and water level measurement equipment. Our products are specified on new construction and retrofit projects around the world. FPS products are installed in over 70 countries, all developed, manufactured and tested in our factory in Nova Scotia, Canada.

FPS is one of very few companies in the world that can provide complete boiler gas conversion expertise, with the ability to provide the optimal ignition equipment, flame scanners, natural gas piping design/fabrication, burner management system (BMS), and combustion control system (CCS), as well as manage local approvals.

FPS continues to be an industry leader in technology advancement; we continue making boilers cleaner, safer and more reliable.

LOCATION

A 45,000 ft² facility in Dartmouth, Nova Scotia, Canada, is home for all project management and design engineering, R&D engineering, and manufacturing/testing of all high-pressure columns, fuel piping systems, ignition equipment, valves, control systems, and electronic products.

FPS also has an engineering and sales offices in Edmonton, Alberta, and Vancouver, British Columbia, with many authorized sales distributors located worldwide. We are also supported by B&W's expansive global network of Sales and Service personnel.



FPS

FLAME SCANNERS

NEXT GENERATION VOODOO

The scanner head, which is sometimes referred to as a sensor or detector, is mounted near the burner and is positioned at such an angle to maintain a direct sight of the burner flame at all times. The optimum head location is determined from boiler characteristics and the relative position of each burner.



Voodoo M2 Head and Module

FLAME SCANNERS OVERVIEW

Since being founded in 1981, FPS has supplied the industry with over 12,000 flame scanner heads. From our most basic ultraviolet (UV) scanners up to our more complex system incorporating Visible (VIS), Infrared (IR) and UV. The Voodoo line of flame scanners offers unsurpassed flame detection capabilities.

Each flame scanning application is inherently unique due to differences in the boiler or heater, burner type, burner layout and fuel types. Our team of product application engineers work closely with users to ensure that the correct scanner system is selected and adapted for the application. The scanner selection process involves a thorough review of the physical layout of the boiler/heater, burner drawings, scanner location within the burner, fuel types and discussion with the user. Once the correct

scanner system is selected, our application engineers will work with our users to ensure the correct placement of the scanner head within the customer's burner equipment. The correct placement of the scanner head is critical to ensure that the scanner is capable of distinguishing between its own burner/ignitor flame and other flames within the boiler or heater.

Like all our products, the flame scanner product line is conceived, designed, fabricated and tested at our head office/factory in Nova Scotia, Canada. This centralized approach allows seamless communication between all FPS engineering, service, design and fabrication personnel, resulting in constant product improvements and innovation. All FPS products are backed by outstanding customer service and more than forty years of quality, integrity and field experience.



Voodoo M1 Module, Tri-Color Scanner Head

VOODOO M1 FLAME SCANNERS

The VOODOO M1 flame scanner is capable of analyzing the varying characteristics of the flame spectrum, thereby offering the user greater flexibility in defining the properties of an acceptable flame. It utilizes a modular set of head electronics to condition signals. The M1 analyzes the frequency spectral characteristics of the light emitted in different wavelengths and compares these to user defined rules to determine the presence of a flame. This system is highly configurable with multiple "flame detected" relays, programmable inputs, several different scanner head options and Windows based tuning software. These options along with the expert assistance from FPS product engineers ensure that this is the best performing scanner in the marketplace.

VOODOO M2 FLAME SCANNERS

The VOODOO M2 flame scanner is designed specifically for propane or natural gas flames. It uses an ultraviolet (UV) tube for highly reliable flame scanning and discrimination. The compact design is also well suited for dual fuel (oil/gas) single burner "package boiler", duct burners, process heaters or similar applications. This flame Scanner can be used stand-alone within a NEMA 4X junction box suitable for burner front mounting, or as an integral component of a control cabinet.

VOODOO M1 FEATURES

- Scanner heads are available to detect light emissions in the VIS/IR spectrums or VIS/IR/UV spectrums.
- All scanner heads are available in direct sighted, rigid fiber optic and flexible fiber optic versions.
- Fiber optic scanner heads incorporate an offset viewing angle lens holder which allow for unprecedented flexibility in fine-tuning the scanners for reliable operation & discrimination of other flames.
- Standard Ethernet interface for programming and MODBUS interface. MODBUS interface provides real-time scanner health as well as flame confidence level.
- Hazardous area classification (Class 1 Division 2).
- Proven effective and reliable on fuels such as natural gas, propane, coal and oil as well as alternative fuel sources such as bio-mass, hydrogen and red liquor.

VOODOO M2 FEATURES

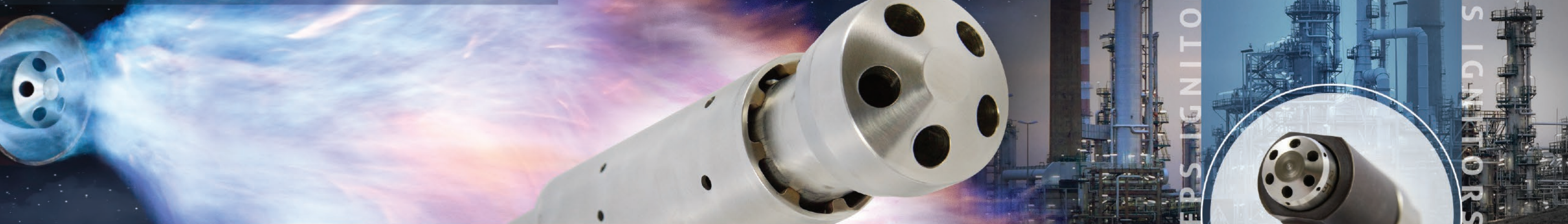
The UV scanner's minimalist design features a mechanical self-check, flame level display, flame detected indication and fault indication. Available with a Hazardous area classification head (Class 1 Division 2).



FPS

IGNITORS

IGNITION EQUIPMENT



Stainless Steel Gas Ignitor Nozzle

IGNITOR OVERVIEW

FPS leads the market in the supply, service and support of reliable ignition equipment, with an international installed base of over 12,000 ignitors, in a wide variety of burner designs and fuel applications. Installations range in size from package boilers with one ignitor to 1300 megawatt boilers with 112 ignitors.

FPS conceives, designs, tests and fabricates all of our ignitors at our head office/factory in Nova Scotia, Canada. This process has been in place since our very first ignitor and allows our product application/service engineers, ignitor design engineers and fabrication personnel to work closely together ensuring a quality ignitor product.

FPS recognizes that our customers have unique ignition requirements; due to the inherent differences in boilers, burners or fuel supply systems. Each ignitor application is different

and must be studied to ensure that the correct ignition product is supplied. Our dedicated team of product application engineers work directly with users of the ignition products to ensure that the correct ignitor is selected and customized for each application. All aspects of the application will be reviewed, including but not limited to: fuel type, fuel source, fuel supply piping, valves, fuel pressure control, desired firing rate, air delivery system, atomizing media, burner type and ignitor location within the burner.

All FPS products are backed by outstanding customer service and more than forty years of quality, integrity and field experience. Through the careful integration of electrical and mechanical components, FPS engineers have been able to achieve optimal performance in fuel atomization, combustion, flame stability and flame monitoring.



FPS 16 Joule PAI

FPS specializes in the use of a dedicated flame rod for ignitor flame detection. The flame rod is reliable, very economical, and works for both oil and gas ignitors. Most notably, the flame rod will provide absolutely 100% discriminating capability against all other boiler flames with no tuning required. It simply guarantees the presence of an established ignitor flame. FPS flame rods are connected to a FPS Voodoo M2 module which uses the principle of flame rectification for flame detection.



FPS GAS IGNITORS

FPS Gas Ignitors are available in heat releases ranging from 1,000,000 Btu/hr to 30,000,000 Btu/hr. All gas ignitors feature three-stage ignition to create a continuous, lively, self-renewing flame unaffected by burner and furnace conditions. Stainless steel gas nozzles and furnace side components are designed to withstand the boiler environment.

FPS OIL IGNITORS

FPS Oil Ignitors are available in heat releases ranging from 2,000,000 to 35,000,000 Btu/hr. The reliability of FPS oil ignitors is enhanced by the atomizer design which produces small, readily combustible droplets of oil. The nozzle design then distributes the atomized oil in a staged manner producing a continuous, lively, self-renewing flame unaffected by burner and furnace conditions.

FPS PLASMA ARC IGNITORS

The FPS Plasma Arc Ignition (PAI) system is designed to provide a high output pulsed spark for the forceful ignition of fuel. Each powerful spark pulse creates a shock at the spark plug tip, which disperses any material collecting on the tip of the spark plug. This continuous cleaning of the spark tip reduces the need for manual cleaning, characteristic of continuous voltage ignition systems.



FPS Oil Ignitor

FPS IGNITOR FEATURES

FPS Ignitors can be supplied to fulfill NFPA Class 1, Class 2, Class 3 & Class 3 Special Ignitor requirements.

- Ignitors are available as stationary, with no moving components for low maintenance or retractable to suit user requirements.
- Gas/Oil dual fuel ignitors are available to allow for quick switching of the ignitor fuel supply.
- All FPS ignitors feature our Plasma Arc Ignition (PAI) system.
- Alternative energy fuels such as bio-diesel, methanol, hydrogen and bio-gas can be utilized with FPS ignitor products.

FPS PLASMA ARC IGNITOR (PAI) FEATURES

- Can be used as a stand alone ignition system for direct sparking of burners firing all fuels including oil and gas.
- Stand alone PAI are available as stationary or retractable to suit the application requirements.
- Available in 8 Joule (3 sparks/sec) or 16 Joule (6 high output sparks/sec).

FPS

V A L V E S

SAFETY SHUT-OFF VALVES

FPS valves are approved to the industry's top standards including: API 607 6th Edition Fire Safe, Factory Mutual (FM) Class 7400 Liquid and Gas Safety Shut-off Valves, CSA 3.16/CGA Interim Requirement No. 60 Lever Operated Gas Shut-off Valves, CGA 3.9 Automatic Safety Shut-off Gas Valves, CSA 6.5/ANSI Z21.2.1 Automatic Valves for Gas Appliances, and CRN registration in all Canadian Provinces. FPS automated valve assemblies are 3rd party Function Safety Certified to a Safety Integrity Level of SIL3.



FPS 88 Series
Three Piece Valve



FPS 90D Series
Flanged Valves

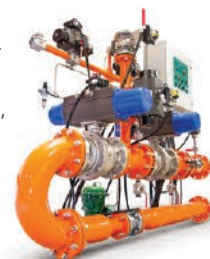
FPS VALVE OVERVIEW

FPS is a leader in reliable, cost-effective, high performance shut-off valve technology. Our automatic and manual shut-off valves are in service in industries the world over: pulp and paper, petrochemical or utility boiler applications. FPS valves provide low maintenance, leak proof and fail safe operation.

The FPS valve line was developed to meet our ongoing requirement for high performance safety shut off valves for use with gas and oil ignitor systems. When developing the valve line, our main criteria was to create a very high quality valve package that would exceed the requirements of CSA and FM valve performance standards. FPS maintains a very high level of valve component inventory at our factory in Nova Scotia, Canada. Customers requiring valves can expect quick quote turn around, expert assistance with product selection, very short delivery times and prompt submittal of quality assurance related documentation.

FPS CUSTOM ENGINEERED VALVE TRAINS

FPS Valve Trains are a perfect solution for customers seeking to reduce the cost of site assembled equipment. FPS provides complete valve train engineering services including: sizing all shut-off valves, strainers, pressure regulation valves, flow control valves and instrumentation. Valve trains are typically designed to CSA 149.1, CSA 149.3, ASME B31.1, and/or ASME B31.3, while also adhering to customer specifications such as painting, material country of origin and NDE requirements. A full quality assurance package is compiled including inspection, test reports, MTR's and weld maps. The fully assembled valve train is electrically wired, pneumatically tubed, pressure tested and all components are functionally tested prior to being crated for shipment.



FPS 88 SERIES THREE PIECE VALVES

The 88 Series design ensures safety, reliability and ease of maintenance. The valve features a three piece body for ease of inline maintenance without breaking the piping connection and is available with NPT, socket weld or butt weld ends, in sizes 1/4" up to 2".

FPS 90D SERIES FLANGED VALVES

The 90D Series design ensures safety, reliability and ease of maintenance. The valve features a full-port two piece body that minimizes pressure drop through the valve, and is available with Class 150 or 300 flanges, in sizes 1/2" up to 6".

FPS VALVE AUTOMATION

Our pneumatic actuators allow fast and reliable valve cycling. The spring return option provides fail open or fail closed security in the event of a power or compressed air failure. Actuators are mounted directly to the valve body, which simplifies actuator removal and eliminates the need for couplings.

A multitude of both VAC and VDC solenoid options are available as well as use of customer specific solenoids.

High visible beacon type limit switches are supplied in either a water tight or Class 1 Div 2 version.

FPS VALVE FEATURES

All FPS valve designs utilize a triple redundant stem seal. Stage 1 is via a pyramidal stem seal, stage 2 is via an O-ring and stage 3 is via multi-layered V-Ring Chevron™ Packing. The blowout proof design is tensioned using Bellville™ washers for the ultimate in maintenance free operation.

- Leak watch windows in all valve castings allow the user to check the stem seal for leakage.
- Bi-directional valve seals prevent leaks in both directions.
- FPS maintains stock of all of our valve components to allow for very quick deliveries.



AQUARIAN

Aquarian electronic level products, were specifically designed to meet the industry's growing needs and demand for a reliable, cost effective and versatile means of sensing water levels in a variety of high and low pressure applications. By passing a square wave $\pm 5\text{VDC}$ voltage through the probe and processing the resulting signal, a distinction between steam and water is made, even in water conductivities as low as 0.5 micromho.



Aquarian Probe

AQUARIAN EQUIPMENT

The Single Probe Alarm Module (SPAM) is an accurate and reliable instrument that provides positive indication of steam or water in high temperature and pressure applications. The SPAM measures resistance and reports the presence of either steam or water, based on fluid conductivity. The probe can be mounted in a column or a 1-1/2" tee. The Swagelok® metal to metal seal assures a leak proof installation with no moving parts. The SPAM is an effective electronic replacement for mechanical float switches. The electronic unit can be conveniently located up to 65 feet away from the probe with low conductivity water and 500 feet away with high conductivity water. Two Form-C contacts provide relay outputs for control circuits. LEDs indicate "WATER" or "STEAM" and a third LED flashes for "POWER/CLOCK", to indicate the presence of power and proper clock function.

Single Probe Alarm Module

The Aquarian 1000Plus is configured with 1 to 4 independent probe channels, redundant power supplies, continuity, level fault monitoring and optional 4-20mA output. Each level relay output is rated at 5A which enables this system to serve as a trip, alarm or on-off control device. Measuring the difference in resistance between high purity water and steam, the Aquarian 1000Plus is commonly used on feedwater heaters, piping and drains, main steam header drains, hot/cold reheat drains and main boiler high/low alarm/trip. The Aquarian 1000Plus very popular on turbine drain systems for turbine water induction protection (TWIP).

Aquarian 1000Plus

AQUARIAN 3000MINI

The Aquarian 3000Mini is a multi-probe system with solid state electronics in a stainless steel enclosure, capable of operating multiple two-color remote displays customized for the number of probes and their locations. Applications for the Aquarian 3000Mini include: boiler steam drum, feedwater heater and deaerator. Standard features: redundant power supplies, clock fault detection of the +/- 5VDC circuit, three way adjustment for water conductivity, 5A output relays for each probe level, as well as fault monitoring relays for electronics, and level detection.



Aquarian 3000Mini

AQUARIAN PROBE

The Aquarian Probe is the Industry's choice. This Swaged style high pressure brazed probe does not require gaskets for sealing and offers a 2 year warranty with a 5 to 10 year life span. Rated for 3000 psi max, 1200°F max the probe is designed to prevent water wicking. Each Aquarian probe is 100% nitrogen gas tested and hydro tested to 6000psi.

AQUARIAN ELECTRONIC LEVEL INDICATION

STANDARD FEATURES

- Aq 3000Mini - Nema 4X Stainless Enclosure
- Swaged style Brazed Probe rated for max 3000 psi, max 1200°F
- 2000 & 3000psi Carbon Steel Water Columns
- Vertical Style Probe Columns
- Nema 4X Column Mounted Junction Box
- Two-color Remote Display

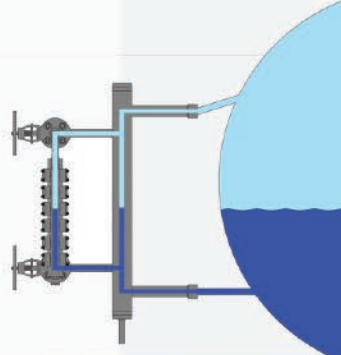
OPTIONAL FEATURES

- 4-20mA and RS-485 Serial Output
- RS485 for 2 Wire Serial Remote Display
- Explosion Proof Enclosures for Hazardous area applications
- Zener barriers can be provided on all Aquarian models to provide an intrinsically safe probe connection.
- Two-color Door Mounted Local Display
- P11, P22 & P91 Chrome Moly Columns
- Stainless Steel Columns



AQUARIAN

Visual Gauge, commonly referred to as a Sight Glass or Level Gauge, is the only technology available to provide "Direct" indication of steam drum water level, thus satisfying the ASME Boiler and Pressure Vessel Code requirements.



650R
Reflex Gauge

1000T High Pressure
Flatglass Gauge

AQUARIAN EQUIPMENT

Aquarian 650R Reflex Gauge is rated for 650psi (350psi/24 Bar for steam) and provides excellent visibility of liquid level. Light refracting grooves in the glass cause the liquid to appear black and steam to appear white. The high contrast between water and steam allows gauges to be stacked on top of one another without concern for blind spots between gauges. Recessed gasket surfaces in both the cover and body facilitate glass and gasket alignment and also help prevent gasket blowout. Belleville spring washers maintain constant gasket loading under thermal and pressure cycles.

Aquarian 1000T High Pressure Flatglass Gauge is rated for 1000psi (69Bar) and is structurally designed with a thicker and wider body to resist deflection. The design meets the most recent changes of the ASME Boiler and Pressure Vessel Code, which no longer permits the use of cross webbing. Belleville spring washers maintain constant gasket loading under thermal and pressure cycles. Precision tempered and ground Borosilicate glass provides high strength and clear visibility, while mica shields protect the glass from the effects of erosion for an extended service life.

The Aquarian 3000 Visual Bi-Color Water Level Gauge

is rated to 3000psi (207Bar) and produces a red/green image to indicate the water level in a high pressure steam drum. Viewable from wide angles, the solid state LED Illuminator provides a clear red/green image and offers a 10 year maintenance free service life. Two discs of premium V-1 quality mica protect and extend the glass life and the Belleville washers eliminate hot re-torquing. This gauge fulfills the requirements of the 2001 ASME Boiler & Pressure Vessel Code. Optional intrinsic Safety Protection and Explosion Proof Protection is available to meet hazardous area classification requirements.



Aquarian
3000Mini



SS Pipe
Chamber &
Aluminium
Indicator
Assembly

The Aquarian 4000 Magnetic Level Indicator (MLI)

provides a totally leak-proof, non-invasive method to measure level. This is especially advantageous when process fluids are dangerous or flammable. The isolation of the indicator from the process fluid also limits the amount of regular maintenance required for the indicator. The Magnetic Level Indicator uses a non-magnetic float with an internal magnet that is coupled to the magnetic two-color indicator flags. Each float is specifically designed to function in the specific gravity (S.G.) of the process fluid present, providing accurate level readings.



Ported Gauge
Components

DID YOU KNOW?

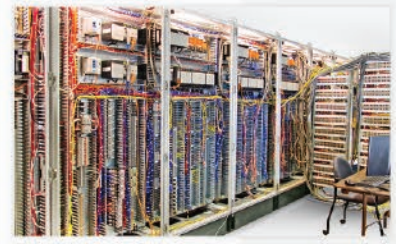
The ASME Boiler and Pressure Code (Section 1 Para. PG-60.1.1) states: "Boilers having a maximum allowable working pressure of 400psi (27Bar) or less shall have at least one gage glass in service at all times. Boilers having a maximum allowable working pressure exceeding 400psi (27Bar) shall have two gage glasses. Instead of one of the two required gage glasses, two independent remote water level indicators (two discrete systems that continuously measure, transmit and display water level) may be provided and the required gage glass may be shut off, but shall be maintained in serviceable condition."

FPS

BURNER MANAGEMENT SYSTEMS

CONTROLS

FACTORY ACCEPTANCE TESTING (FAT): Every BMS is exhaustively tested at the FPS factory before having the client attend a complete project FAT. Completing a 100% hardwired checkout of the BMS wiring, safety logic and operator interface at the factory ensures a successful startup and prevents delays during onsite commissioning.



FPS HMI Screens



FPS Burner Management System

BURNER MANAGEMENT SYSTEMS

Control and automation systems, covering all aspects of industrial control, are designed and manufactured by FPS. Engineered control systems are designed to provide continuous, reliable, precise control to meet each customer's specific requirements.

FPS has the experience and capability to design all of the systems that make up a plantwide control system, with our primary focus doing the design and supply of Burner Management Systems (BMS). A BMS controls the safe firing and shutdown of fuel for a boiler and provides protection against malfunctions of fuel firing equipment and associated air systems

FPS flame scanners, ignitors, water level management, and valves can be easily integrated with the controls for a "complete BMS package" which can be designed for any boiler ranging from single burner package boilers up to the largest fuel fired boilers in service.

FPS designs and manufactures all systems using client preferred control hardware/software platforms. With significant experience in all control platforms, a FPS engineered BMS includes the system layout and communications, field wiring design, logic design and programming, and operator interface configuration.

FPS employs a "cradle to grave" approach to project management and BMS engineering. Engineers and project managers are involved in a project from the proposal stage through to the commissioning of the equipment at the clients site. All programming and testing is completed by the FPS design engineer. This provides customers with consistency on a project and ensures the engineers and project managers have a complete and intimate knowledge of all aspects of the project they are executing.



GAS CONVERSIONS

SINCE 2000, FPS has completed more than seventy boiler gas conversions in North America.

Our project team will provide detailed design, sizing, and specification of the natural gas piping system, boiler modifications, burner selection, ignitor selection and installation, flame scanner selection, BMS and combustion control modifications, and project management from project launch through return to service.

APPROVALS

Each BMS is designed in accordance with industry defined codes and standards, including compliance with NFPA 85, CSA B149.3, Factory Mutual, BLRBAC, SIL 2 / SIL 3 (TUV), and other industry or client specific codes as required. FPS has several TUV certified engineers on staff for SIL approved system design (SIL 2 / SIL 3).

PLANTWIDE CONTROLS

In addition to Burner Management Systems, FPS also provides complete controls expertise, including: plantwide DCS, combustion control, motor control, data acquisition, sootblower control, water treatment plant, turbine runup and hydro station controls.

Steam Power Industries Hardware/Software Systems



ADDRESS 10 Mosher Drive
Dartmouth, Nova Scotia
Canada B3B 1N5

PHONE 902.468.2743

SALES sales@fossil.ca

TECH SUPPORT support@fossil.ca

www.fossil.ca

Babcock & Wilcox

1200 E Market Street, Suite 650
Akron, Ohio, U.S.A. 44305
Phone: +1 330.753.4511

www.babcock.com    

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RENEWABLE | ENVIRONMENTAL | THERMAL

Established in 1867, Babcock & Wilcox is a global leader in advanced energy and environmental technologies and services for the power, industrial and renewable markets.

For more information or to contact us, visit our website at www.babcock.com.