

Installation, Operating and Maintenance Manual

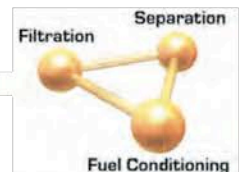
SMART FPS FX

SMART Fuel Polishing System



- Fully Automated & Programmable
- Integrates with Vessel Monitoring Systems
- Modular “Plug & Play” Flexibility
- Unique Safety & Alarm Features
- Continuous-Duty Pumps, Viton Seals

Optimal Fuel Quality • Reliable Power



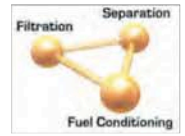
INSTALLATION AND OPERATING MANUAL

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SMART FPS FX

SMART Fuel Polishing Systems



SMART Fuel Polishing Systems are programmable, fully automated Fuel Optimization Systems that remove water, sludge and contaminants. They condition and stabilize fuel, keeping it dry and free from microbial contamination. SMART FPS Systems keep your tanks clean and your fuel in "Clear & Bright" pristine condition at all times. AXI's LG-X Fuel Conditioner reverses fuel deterioration and sedimentation to sub micron levels, preventing clogged filters, extending injection system service life, and reducing smoke, emissions and downtime.



Generators and pumps operating in remote locations are ideal applications for SMART FPS Systems. Fuel has a limited shelf-life and even "fresh fuel" could contain water, sediment and microbes upon delivery. Fuel filters should last thousands of hours. However, frequent filter changes, tank cleaning and replacing fuel have become common maintenance practices instead of serious warning signs of fuel problems.

SMART FPS Systems reverse fuel deterioration while decontaminating, cleaning and optimizing the fuel for guaranteed continuous, uninterrupted service.

SMART FPS Systems feature:

- SMART Filtration Controllers
- Fully Automated and Programmable Operation
- Integration with Vessel Monitoring Systems
- Modular "Plug & Play" Flexibility
- Unique Safety & Alarm Features
- Continuous-Duty Pumps, Viton Seals

For safe operation, the SMART FPS FX is equipped with an automatic pump shut-down and indicators when filter elements require service. Also included are indicators for high pump vacuum, high water in fuel and leaks.

SMART FPS FX SPECIFICATIONS

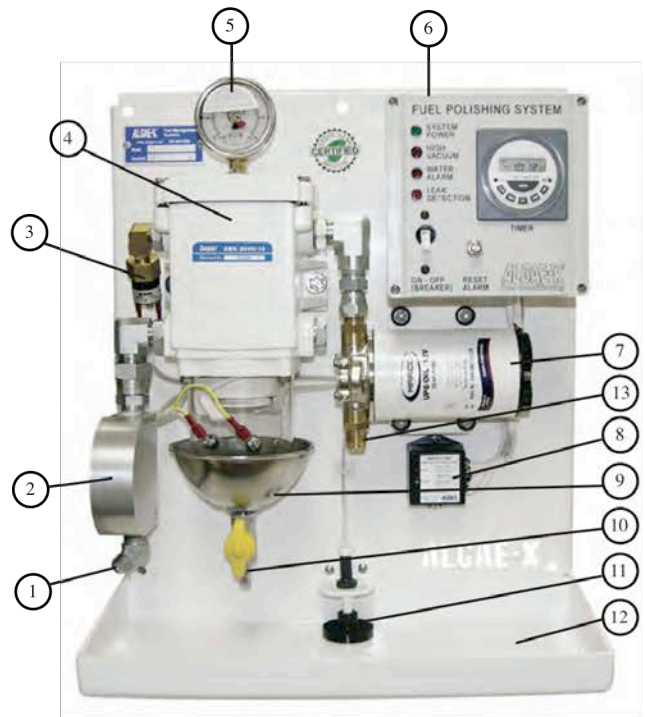
Flow Rate	150 GPH
Primary Filter/ Water Separator	10 μ or 30 μ Particulate
Fuel Conditioner	LG-X 500
Smart Filtration Controller	SMART FPS System Monitor
Power	12V DC / 24V DC 10A 5A
Plumbing	Stainless Steel
Ports	1/2" 37° Flare Connectors
Construction	Powder Coated Aluminum Back Plate
Dimensions	20" x 17" x 8" (38 x 47 x 19 cm)
Weight	30 lbs System
Not for use with fluids that have a flash point below 100°F.	

The system is automatically operated by the programmable control panel. The controller's alarm functions and pump shut-down are triggered if filter elements require service, if high pump vacuum, optional leak detection or if there is water in the separator. The wiring harness with plugs easily connects the SMART Filtration Controller with the FPS allowing for greater flexibility in installation and access where it's most convenient.

The **principal components** are a continuous-duty pump with primary filter/water separator with vacuum sensor and gauge, an ALGAE-X Fuel Conditioner and a SMART Filtration Controller.

The **SEPAR primary filter** protects the pump, coalesces and removes water and particulate. The patented **ALGAE-X Fuel Conditioner** prevents and reverses fuel degradation, agglomeration and microbial contamination.

Implementing SMART FPS Fuel Polishing and Transfer Systems will guarantee **Optimal Fuel Quality for Reliable Power At All Times**. SMART FPS Systems prevent downtime, periodic tank cleaning, replacing out-of-spec fuel and fuel-quality related injection system repairs.

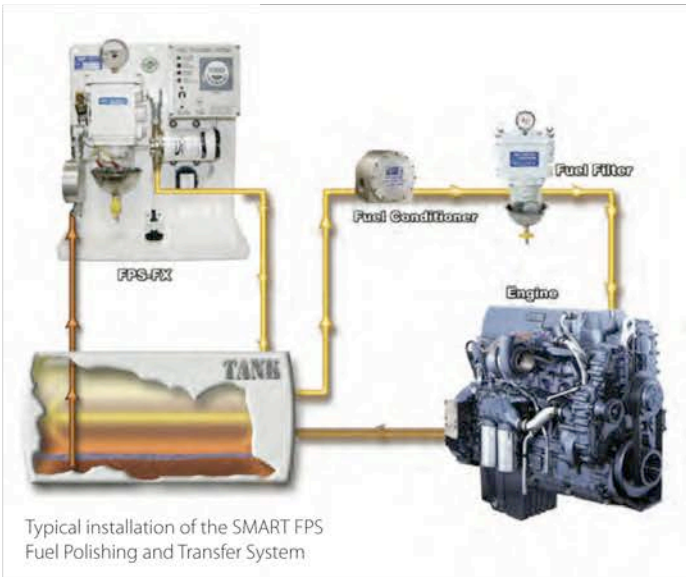


Inside the SMART FPS FX

1. Fuel Inlet (From Tank)
2. ALGAE-X® Fuel Conditioner
3. Vacuum Switch
4. Separ Filter
5. Vacuum Gauge
6. Control Panel
7. Motor with Coupled Gear Pump
8. Water Sensor
9. Sight Bowl
10. Drain Valve
11. Leak Detector
12. Drip Tray
13. Fuel Discharge (To Tank)

SMART FPS Accessories:

- AFC-705 Fuel Catalyst
- Wide range of filter elements
- Fuel Sampling Pump Kit
- Microbial Contamination Testing Kit



Typical installation of the SMART FPS Fuel Polishing and Transfer System

GENERAL SPECIFICATIONS

SMART FPS-FX

Flow Rate	approx. 2.5 gpm / 150 gph
Outline Dimensions	20" x 18" x 8" (H x W x D)
System Weight	25 lbs
Operating Temperature	32 - 104° F; 0 - 40° C
Electrical	12 V DC, 10 A (standard) - 24 V DC / 10 A also available
Service Space	4" space on top , to facilitate changing filter elements

Pump	Brass Gear Pump
Suction capability (primed).....	10 ft vertical lift (lines >1/2") – self priming up to 5ft (wet gears)
Timer	Programmable digital timer
Inlet	1/2" SAE male flare fitting
Outlet	1/2" SAE male flare fitting
Max. Fluid Viscosity	29 cSt

Note: The SMART FPS-FX is designed to meet environmental standards for safe operation (NOT for use with fluids that have a flash point below 100°F (38°C), e.g.: gasoline, alcohol, ...)

FPS-FX-R

Flow Rate	approx. 2.5 gpm / 150 gph
Outline Dimensions	28" x 17" x 8" (H x W x D)
System Weight	25 lbs
Operating Temperature	32 - 104° F; 0 - 40° C
Electrical	12 V DC, 10 A (standard) - 24 V DC / 10 A also available
Service Space	10" space on top to facilitate changing filter elements

Pump	Brass Gear Pump
Suction capability (primed).....	10 ft vertical lift (lines >5/8") – self priming up to 5ft (wet gears)
Timer	Programmable digital timer
Inlet	1/2" SAE male flare fitting
Outlet	1/2" SAE male flare fitting
Max. Fluid Viscosity	29 cSt

Note: The SMART FPS-FX-R is designed to meet environmental standards for safe operation (NOT for use with fluids that have a flash point below 100°F (38°C), e.g.: gasoline, alcohol, ...)

PRIMARY INSPECTION

Upon arrival, the FPS Fuel Polishing System and accessories must be visually inspected before installation. Shipping and handling may cause physical or electrical problems.

Checklist:

- If the packing crate shows signs of damage inspect the SMART FPS-FX for damages since that could indicate internal mechanical or electrical problems.
- Inspect filter for cracks or missing parts.
- Check vacuum gauge for spilled liquid.
- Check all plumbing joints. Tighten fittings and joints as necessary.
- Check all electrical terminals and connections for tightness.

INSTALLATION



! IMPORTANT ! It is recommended that only qualified, experienced personnel, familiar with this type of equipment, who have read and understood all the instructions in this manual should install, operate and maintain the system.

MOUNTING

The Smart FPS FX should be wall mounted on a hard, level surface. This unit is designed for well-ventilated indoor use and should be located as close to the tank as possible. Allow about 4" of space on top of the unit to change the filter element comfortably and sufficient space on the bottom to drain the system. This space is also necessary to ensure sufficient ventilation of cooling air for the motor.

ELECTRICAL



! WARNING ! To avoid the risk of electric shock make sure that the power supply to the system is disconnected and ensure that the system is at zero volts, before working on any of the system's electrical parts.

Make sure that the motor has the same rated voltage as your electrical system. FPS-FX AND FX-R systems are available in 12V DC & 24V DC.

The systems with either 12 V DC or 24 V DC motor connect to the positive lead from your battery with the red wire of the motor and to the negative lead with the black wire. After the initial wiring of the motor check system operation to insure that it is running in the correct direction. If the motor is running in the wrong direction or is not running at all, reverse the two electrical leads.



! WARNING ! The system must be properly grounded for operator safety.

Depending on length of run, use #14 AWG or larger copper wiring and connect system to a separate 10A breaker (not included in shipment).

PLUMBING

Use proper quality approved fuel line materials with at least 1/2" inner diameter. Smaller plumbing will place excessive load on the motor and shorten its life. A valve should be installed on the inlet and outlet port of the FPS system.

The pick-up tube/line(s) (suction) should originate from the lowest point of the tank to remove all water and should be connected directly to the systems ALGAE-X[®] Magnetic Fuel Conditioner ("IN" port). For optimal performance, insure that the inlet (suction) line(s) are free and nothing is restricting their flow.

Note: It is recommended to install an oversized, low restriction foot valve to keep the system primed, especially if the system is located above the lowest possible fuel level in the tank.

If the FPS Fuel Polishing System is mounted below tank top level, a priming tee should be installed on the highest point of the suction line to be able to easily prime the systems delivery line.

The return line(s) (discharge) should be plumbed to the outlet of the pump ("OUT" port) and enter the tank as far as possible from the pick up tube of the FPS system close to the tank bottom. For optimal performance, insure that the outlet (discharge or return) line(s) are free and nothing is restricting their flow.

The system capabilities are 10 ft suction (vertical) lift, when connected to piping of 1/2" ID or more with no additional flow restrictions such as valves, 90-degree connectors or other plumbing accessories. For continuous optimal performance, make sure suction and discharge lines are free and that nothing is blocking the flow of fuel.



! WARNING ! The gear pump is capable of developing extremely high pressure. Care must be taken not to operate the pump with either the suction (inlet) or discharge (outlet) lines closed. Serious damage may occur.



! WARNING ! If the pump is allowed to run without fuel, pump damage will occur.

IMPORTANT INSTALLATION PRECAUTIONS

The suction line of the FPS system should be independent and separate from the suction line of the engine. If that is not possible, appropriate valves must be installed to completely separate the FPS from the engine fuel system to prevent any possible interference with safe engine operation.

The discharge should also be independent and separate of the engine's fuel return line back to the tank. If the return line from the engine and the discharge of the FPS Fuel Polishing System have to be combined in any way, adequate valves should be installed to prevent any possible interference with safe engine operation. (Many engines are already equipped with a check valve – check with engine manufacturer).

Note: If any of the FPS system's fuel lines are used in combination with the engine's fuel system, the FPS Fuel Polishing System should be disabled during engine operation.

OPERATION



! WARNING ! Do not fill with gasoline. This System is not meant for use with gasoline nor with other flammable liquids having a flash point less than 100°F. Use with gasoline or use with any flammable liquids at a temperature exceeding their flash point, presents an immediate explosion and fire hazard.



! WARNING ! Do not use the FPS at a temperature exceeding the flash point of its contents.



! WARNING ! Only run the system when you are able to supervise it. Operating the Smart FPS FX / FX-R on an unattended vehicle, vessel or facility is NOT recommended.

It is necessary to prime the filter before initial use. Remove the top filter cover by removing the four wing nuts. Fill the bowl and filter body, as well as the suction line with diesel fuel and replace the cover. The timer can now be set to the desired run time. The pump will automatically shut off after this pre-set time. Set the tell-tale gauge pressure indicator (red pointer) to slightly above the black needle prior to operation. The gauge will indicate maximum vacuum pressure during system operation. When the indicator reaches 15" HG, it is time to back-flush or change the element. The same procedure is necessary if the water level reaches 30% of the clear bowl.

Servicing and Back-flushing the FPS filter:

1. Turn off the FPS pump motor
2. Open the brass colored bleed screw on the top of the filter cover
3. Place a fuel waste container below the yellow safety drain valve at the bottom of the filter bowl
4. Open the yellow safety drain valve (push & turn counter clockwise)
5. Close after approximately 2 seconds
6. After approximately 10 seconds reopen the drain valve
7. Close after visible sediment, particles and water are drained from the bowl
8. Prime the filter by removing the cover (4 wing bolts) and pouring clean diesel fuel into the filter body until the fuel level reaches the top of the filter body
9. Replace the lid. Note: evenly tighten the wing bolts to ensure a good seal
10. Close bleed screw on top of the lid
11. The FPS is ready for operation

Note: Elements can be back-flushed up to 5 times before replacement is required

Note: Disposal of fuel should be done in accordance with Federal, State and Local regulations.



! WARNING ! Some fuels may have been treated with biocides. Biocides are extremely toxic and may enter the body through the skin. It is recommended to use adequate protection and avoid skin contact with biocide-treated fuels.

STABILIZING AND OPTIMIZING FUEL QUALITY

We recommend treating the fuel with the **ALGAE-X® Fuel Catalyst (AFC-705)**. This will enhance and accelerate the tank cleaning process by breaking down and dissolving existing tank sludge. AFC-705 will decontaminate compartments of the tank that are out of reach of the suction line. Depending on the condition of the fuel and the amount of sludge build-up, it is recommended to initially use a double dose of one to twenty-five hundred (1:2500) instead of one to five thousand (1:5000) This has proven to be very helpful in accelerating the tank cleaning process. AFC-705 contains detergent, surfactant, dispersant, corrosion inhibitor, lubricity enhancer and combustion catalyst. It does not contain biocides. AFC-705 should always be used periodically in particular to stabilize fuel that is stored for longer periods of time.

Note: In cases of severe tank contaminant build-up and high water level in bottom, it is recommended to polish the fuel before initial use of an FPS system.

TROUBLESHOOTING

No fuel delivery

1. Pump does not run
2. Pump and filter are not primed
3. Fuel supply line blocked
4. Lift is too high
5. Air leak in fuel supply to pump
6. Pump rotation direction incorrect
7. Intake or outlet valve closed
8. Foot (check) valve installed backwards

Insufficient fuel delivered

1. Air leak at inlet
2. Lift too high
3. Pump worn
4. Inoperative foot valve
5. Piping improperly installed or dimensioned
6. Filter/water separator plugged

Rapid pump wear

1. Pump has been run dry or with insufficient fuel
2. Plumbing on inlet side not appropriately dimensioned

Pump requires too much power

1. Air in plumbing lines
2. Liquid too viscous

Noisy operation

1. Insufficient fuel supply
2. Air leaks in the inlet pipe
3. Air or gas on the suction side

Motor does not turn or turns intermittently

1. Control power not available
2. Circuit breaker on FPS tripped
3. Pump failed and seized
4. Motor failure

Pump leaks fuel

1. Loose pump plumbing fittings
2. Worn pump shaft seal
3. Excessive head from overhead storage tank
4. Worn pump O-rings or seals

FUEL POLISHING SYSTEMS WARRANTY

LIMITED WARRANTY

ALGAE-X® International makes every effort to assure that its products meet high quality and durability standards and expressly warrants the products described herein, against defects in material and workmanship for a period of one (1) year from the date of purchase. This warranty is not intended to supplant normal inspection, care and service of the products covered by the user, and shall not obligate ALGAE-X® to provide free service during the warranty period to correct breakage, maladjustment or other difficulties arising out of abuse, misuse, or improper care and maintenance of such products. Our express warranty is subject to the following terms and conditions:

1. This warranty shall only extend to and is only for the benefit of original purchasers who use the products covered hereby
2. Any warranty claim received by ALGAE-X® after one (1) year from the date of purchase will not be honored even if it is claimed that the defect occurred prior to one (1) year from the date of purchase.
3. This warranty shall not apply to products (1) which have been tampered with, altered or repaired by anyone other than ALGAE-X® without the express prior written consent of ALGAE-X® (2) which have been installed improperly or subject to misuse, abuse, accident, negligence of others, improper operation or maintenance, neglect or modification, or (3) which have had the serial number altered, defaced or removed.
4. The liability of ALGAE-X® under this warranty is limited to the repair or replacement of the defective product. ALGAE-X® assumes NO LIABILITY for labor charges or other costs incurred by any purchaser incidental to the service, adjustment, repair, return, removal or replacement of products. ALGAE-X® ASSUMES NO LIABILITY FOR ANY GENERAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL, CONTINGENT OR OTHER DAMAGES UNDER ANY WARRANTY, EXPRESS OR IMPLIED, AND ALL SUCH LIABILITY IS HEREBY EXPRESSLY EXCLUDED.
5. ALGAE-X® MAKES NO WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, WITH RESPECT TO THE PRODUCTS COVERED BY THIS WARRANTY POLICY, EXCEPT AS EXPRESSLY PROVIDED FOR HEREIN. NO EMPLOYEE, AGENT, REPRESENTATIVE OR DISTRIBUTOR IS AUTHORIZED TO MAKE ANY WARRANTY ON BEHALF OF ALGAE-X® OTHER THAN THE EXPRESS WARRANTY PROVIDED FOR HEREIN.
6. ALGAE-X® reserves the right at any time to make changes in the design, material, function and specifications of its products. Any such changes shall not obligate ALGAE-X® to make similar changes in such products that were previously manufactured.

WARRANTY CLAIM PROCEDURE

To make a claim under this warranty, please call our ALGAE-X® at (239) 690 9589 or (877) 425-4239, and provide: Name and location where unit was purchased, the date and receipt of purchase, model number, serial number, and a detailed explanation of the problem you are experiencing. The Customer Service Representative may, at the discretion of ALGAE-X®, arrange for a Field Engineer to inspect your system. If the inspection discloses a defect covered by its limited warranty, ALGAE-X® will either repair or replace the defective parts or products. ALGAE-X® assumes no liability, if upon inspection, ALGAE-X® or its representative determines that there is no defect or that the damage to the system resulted from causes not within the scope of this limited warranty. For service and sales, please contact ALGAE-X®:

ALGAE-X® International
5400-1 Division Drive, Fort Myers, FL 33905 • 877-425-4239 • Fax: 239-690-1195
Internet: www.algae-x.net • Email: algae-x@algae-x.net

TECHNICAL ASSISTANCE AND ORDERING

Please write to, fax, email or call:

ALGAE-X® International
5400-1 Division Drive
Fort Myers, FL 33905
Tel: 239-690-9589
Fax: 239-690-1195
Email: algae-x@algae-x.net
Internet: www.algae-x.net

Please provide the following information:

Serial Number of your FPS (located on the inside behind the timer) the required part numbers and quantity.

REPLACEMENT FILTER ELEMENTS

FPS-FX:

01030	30 Micron filter element
01010	10 Micron filter element
01060S	60 Micron Stainless Steel re-usable filter elements
30556	Lid Gasket

FPS-FX-R:

RAC-2020PM-OR	30 Micron filter element
RAC-2020TM-OR	10 Micron filter element

Also available:

- ALGAE-X® Fuel Polishing Systems in kit form
- Larger capacity, custom designed systems for higher flow rates and larger tanks
- Digital Flow Meter
- Rotor Sight Glass

SMART FPS-FX / FX-R SYSTEM IDENTIFICATION

Serial Number: _____ (e.g. B 030010 – FFX)

FPS-FX:

Voltage: 12 V DC
 24 V DC

Filter Element: 10 Micron
 30 Micron
 60 Micron Stainless Steel

FPS-FX-R:

Voltage: 12 V DC
 24 V DC

Filter Element: 10 Micron
 30 Micron

Inspected by: _____ Date: _____

APPENDIX A - ABBREVIATIONS USED IN THIS MANUAL

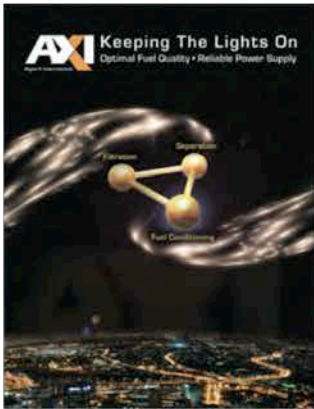
Abbreviations of terms used with Automated Fuel Filtration Systems. When following a drawing utilize this guide to define abbreviated system and component names. This is a master list. The drawings and text pertaining to your equipment may not contain all these terms.

AC	Alternating Current	OPT	Option
AHR	Alarm Horn Relay	PCB	Printed Circuit Board
AH	Alarm Horn	PCRX	Pump Control Relays
BPRV	Back Pressure Regulating Valve	PG	Pressure Gauge
BRK	Motor/Pump Bracket	PLR	Pipe Leak Relay
BV	Ball Valve	PRV	Pressure Relief Valve
C	Contactors	PRS	Pressure Switch
CB	Circuit Breaker	PS	Power Supply
CSR	Check Strainer Relay	PSI	Pounds Per Square Inch
CV	Check Valve	PSR	Pressure Switch Relay
DC	Direct Current	PRR	Pump Running Relay
DPDT	Double Pole Double Throw	SC	Swing Check Valve
F	Fuse	SOL	Solenoid
FLWS	Flow switch	TB	Terminal Block
FS	Float switch	T	Control Transformer
GA	Gauge	TDR	Time Delay Relay
GAL	Gallons	TEFC	Totally Enclosed, Fan Cooled
GPM	Gallons Per Minute	THR	Tank Heater Control Relay
HFL	High Fuel Level Relay	TS	Transducer Pressure Switch
HG	Mercury	V	Voltage
HP	Horsepower	VAC	Voltage, Alternating Current
HZ	Hertz	VDC	Voltage, Direct Current
I.D.	Inside Diameter	VG	Vacuum Gauge
JB	Junction Box		
“ HG	Inches of Mercury		
L	Lamp		
L.E.D.	Light Emitting Diode		
LFF	Loss of Flow Relay		
LFL	Low Fuel Level Relay		
LPR	Low Pressure Relay		
MDB	Main Distribution Block		
MDS	Main Disconnect Switch		
MOT	Motor		
N.C.	Normally Closed		
NEC	National Electric Code		
NEMA	National Electric Manufacturers Assoc.		
N.O.	Normally Open		
NP	Nameplate		
NPT	National Pipe Thread		
O.D.	Outside Diameter		
OLR	Over Load Relay		

AXI designs and manufactures standardized and custom-engineered Automated Fuel Conditioning, Fuel Polishing and Transfer Systems, Tank Cleaning Equipment, Fuel Additives and In-line Fuel Conditioners to ensure optimal fuel quality at all times.

Our scope of expertise covers fuel storage and fuel supply systems from single engine installations to power plants. AXI is your single source for all fuel conditioning related equipment and support available world-wide.

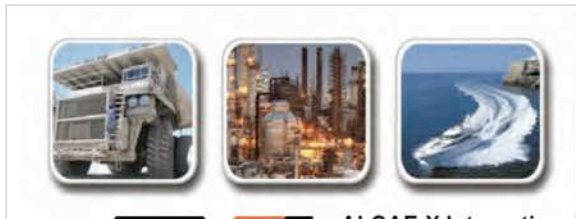
- Peak Engine Performance
- Reliable Power Supply
- Lower Maintenance Costs
- Lower Exhaust Emissions



Read about the secret life of fuel and find solutions in the AXI Brochure, available at www.AXIFuelConditioning.net.



See the full product line in the AXI Systems and Equipment Catalogue, available at www.AXIFuelConditioning.net.



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