SELF-REGULATING VARIABLE SPEED FIRE PUMP UNITS

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American Fire Sprinkler Association

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Currently, Steven has the title of Global Product Manager - Fire Systems for the Building System Solutions Group at Armstrong Fluid Technology. In this role, Steven provides leadership to product development, and business strategy of the Global Armstrong Fire business. Prior to joining Armstrong in 2008, Steven held various product management roles for an electrical supply and distribution equipment manufacturer. He has participated with numerous industry associations, including currently sitting on the NFPA 20 technical committee and holds a degree in Electrical Engineering.

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HOUSEKEEPING ITEMS

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1) scan badge upon entry,
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National Fire Protection Association
The authority on fire, electrical, and building safety

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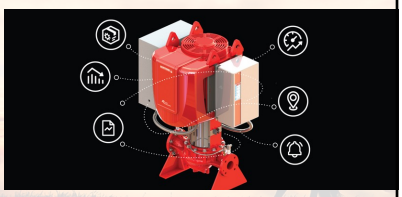
Introducing the Self-Regulating Variable Speed Fire Pump

The Present and Future Best Option for Intelligent Fire Protection



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Benefits of Variable Speed Fire Suppression

- Lower Costs (PRVs, Piping)
- More Efficient (Power)
- Precise Pressure Control
- Optimal for Variable Demand
- Safer for Piping Networks
- Reduce Wear on Equipment
- Automatic Compensation for Supply Variability

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Variable Speed Fire Suppression - Options

Variable Speed Electric Fire Pump Controllers (VFD)

Diesel Engine with Pressure Limiting Driver (PLD)

Self Regulating Variable Speed Fire Pump Units

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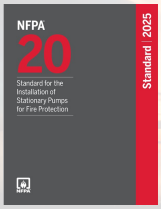
Self Regulating Variable Speed Fire Pump Units

NFPA 20, 2025 Edition, Section 4.8



4.8: Self Regulating Variable Speed Fire Pump Units:

4.8.1 to 4.8.24

4.8.2: A self-regulating variable speed fire pump unit shall be factory assembled and listed as a unit

4.8.3: Each self-regulating variable speed fire pump unit shall be provided with an across-the-line fire pump controller in accordance with Chapter 10

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Self-Regulating Variable Speed Fire Pump Units

Integrates:

- Vertical In-Line Fire Pump
- Pressure transducer on suction and discharge
- Electric Motor
- Variable Speed Drive (frequency converter)
- Automatic-bypass
- Microprocessor speed control module

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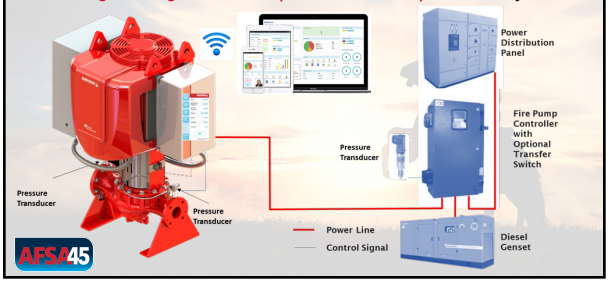
Self Regulating Variable Speed Fire Pump Units - System



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Performance Management Service

- A (**SECURE**) cloud-based Performance Management service.
- Industry leading analytics and pump specific insights.
- Enhanced reliability and sustained optimal performance

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Performance Management Service - Data

Time Stamped Reports every time the pump unit runs with:

- Suction Pressure
- Boost Pressure (calculated and measured)
- Discharge Pressure
- Flow
- Power Draw
- Current Draw
- Line Voltage

Reports can either be viewed on the web page or downloaded as PDF

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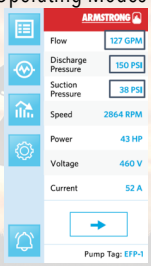
Self Regulating Variable Speed Fire Pump – Operating Modes

Three operating modes:

1. **Principle Operating Mode: Constant Discharge** Pressure regulated by sensor (discharge, or suction)
2. **Ancillary Operating Mode: Constant Boost** Sensorless boost pressure control in variable speed
3. **ByPass Operating Mode: Constant Speed** Through automatic VFD by-pass switch



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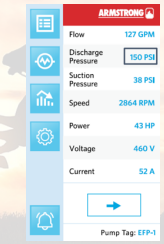
Principal Operating Mode: Constant Discharge

The principal operating mode for the unit is "Constant Discharge"

The onboard control will read the pressure sensors on the pump unit

From that pressure reading the speed control unit will adjust the speed of the pump unit

This will ensure the discharge pressure remains constant regardless of changes to the suction pressure or flow demand from the system



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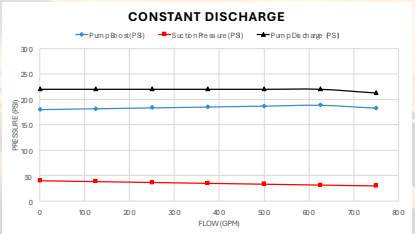
Principal Operating Mode: Constant Discharge



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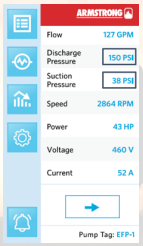
Ancillary Operating Mode: Constant Boost

The ancillary operating mode for the unit is "Constant Boost"

The onboard controls will only revert to this mode of operation if the pressure sensors on the pump unit are not reading correctly

In this mode the unit reverts to an internal mapping to ensure a constant boost pressure is provided by the pump unit

The discharge pressure will vary due to changes in the suction pressure



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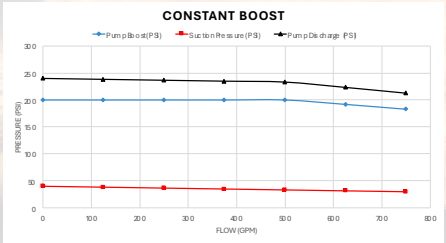
Ancillary Operating Mode: Constant Boost



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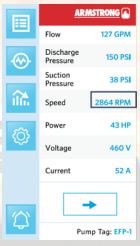
Bypass Operating Mode: Constant Speed

The bypass mode for the unit is "Constant Speed"

The pump unit will only revert to this mode of operation if bypass has been engaged

In this mode the unit reverts to a traditional constant speed fire pump

The discharge pressure will vary due to changes in the suction pressure and flow demand of the system



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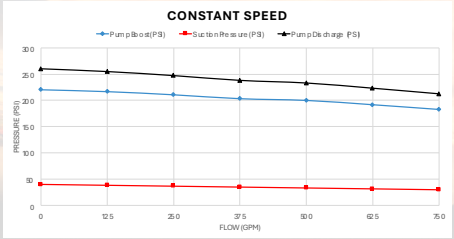
Bypass Operating Mode: Constant Speed



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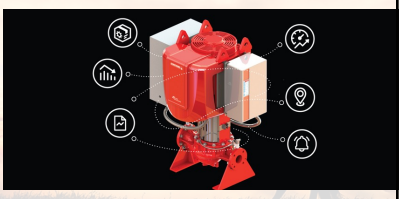
What applications Benefit from a Self Regulating Variable Speed Fire Pump?



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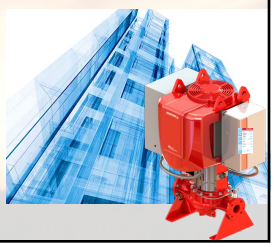
Applications that Benefit from Variable Speed Fire Pumping Solutions

High Rise Buildings
Eliminate PRV's see details in upcoming example.

Retrofits
Buildings with older piping systems that may not be able to survive the water hammer a new constant speed fire pump system would produce.

Unstable Water Supply Pressures
System can be designed without concern about the large difference in water pressure between minimum and maximum suction pressures.

Lower Electrical Demand During Startup
DE Fire pumps with integrated VFDs reduce peak inrush current by up to 30% compared to soft start controllers, minimizing infrastructure strain and lowering demand charges.



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Special Customer Scenarios That are also resolved by the SRVSFPU

Large Loop Systems
In expansive looped piping networks, DE Fire pumps dynamically adjust to maintain consistent pressure across varying demand zones, improving system responsiveness and reducing energy waste.

Dual Water Supplies
DE Fire pumps intelligently manage transitions between municipal and secondary water sources, ensuring uninterrupted protection and optimized performance regardless of supply conditions.

Water Hammer Leakage Risk
By modulating speed during startup and shutdown, DE Fire pumps mitigate pressure surges that cause water hammer — reducing the risk of pipe fatigue and leakage in sensitive systems.

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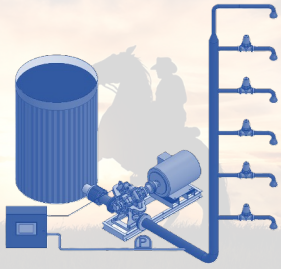
Example: Mid-Rise Building

A sprinkler activates causing water to flow. Pressure in the system drops below the setpoint of the fire pump controller that then starts the pump.

The pump runs at rated speed and maintains the pressure in the fire system.

The local Pressure Regulating Valves ensure that the branch lines and sprinklers are not exposed to anything above their rated pressure.



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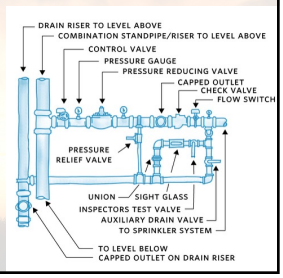
Fire System: Understanding the PRV

Sprinkler Control PRV's typically require:

- Input pressure gauge
- Output pressure gauge
- Bypass lines
- Flow switch
- Tamper switch
- Connection to 3-inch drain riser

NFPA 25 Requires:

- Quarterly inspections
- Annual partial flow test
- 5-year full flow test



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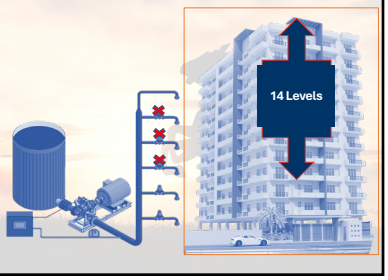
How Many PRVs?

Sprinkler piping is usually not to be exposed to greater than **175psi**

System is usually designed to have up to **100 psi at the topmost branch line** (65 psi in some jurisdictions)

Column of static head pressure translates to about 75 psi (173 ft), or 14 building levels, until PRVs are required



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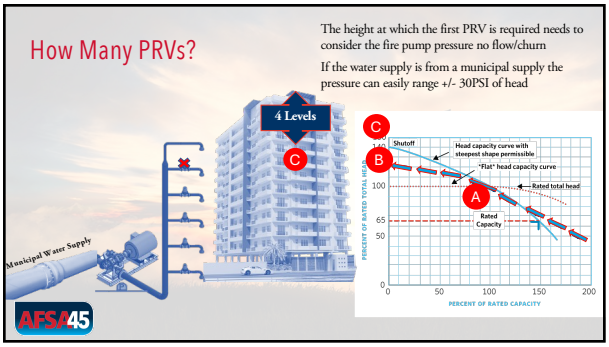

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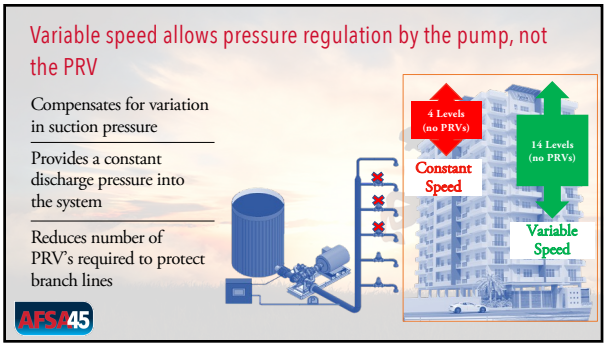

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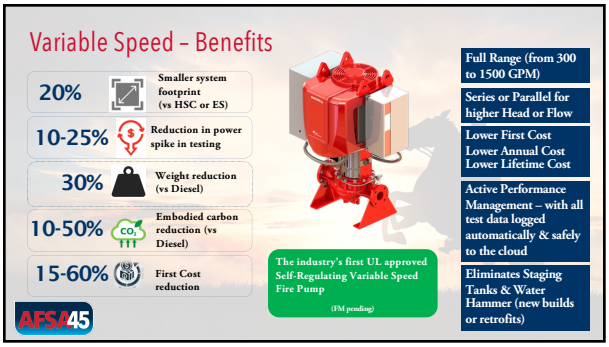

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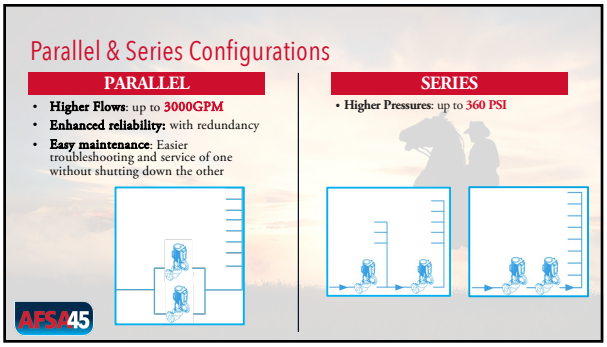

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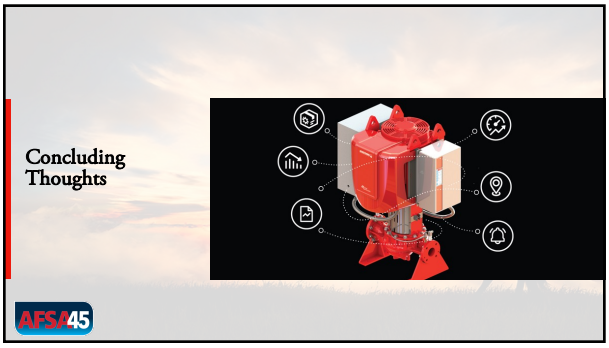

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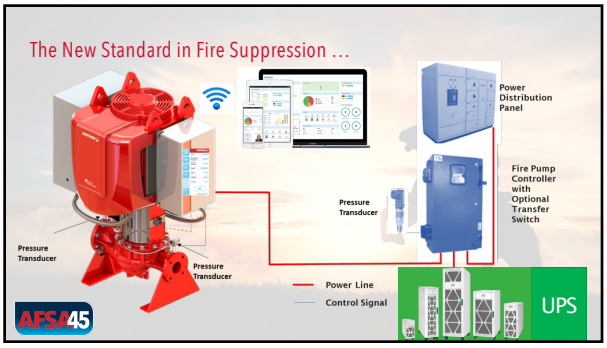

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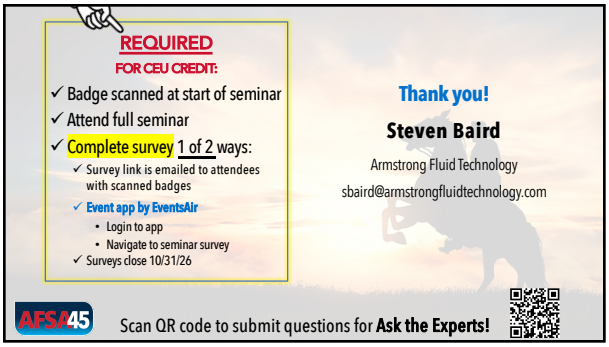
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✓ Attend full seminar
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Thank you!
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AFSA45
Scan QR code to submit questions for Ask the Experts!

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2027 Training Schedule

WEBINARS

1/6	Updates to NFPA 20
1/20	Calculating Pressure Reducing Hose Valves
2/3	Consumer Alert: Nitrogen in Sprinkler Systems
2/17	Reviewing Hydraulic Calculations
3/3	Updates to NFPA 13, 2028 Ed.
3/17	Updates to NFPA 13R & 13D, 2028 Eds.
4/7	Topic Coming Soon
4/21	NFPA 25: Roles & Responsibilities
5/5	Standpipe Flow Test Procedures
5/19	Storage 101
6/2	NFPA Technical Meeting - Voting Guide
6/16	Topic Coming Soon
6/30	Topic Coming Soon
7/7	Updates to NFPA 14, 2027 Edition
7/21	Adjacent Hazards & Design Methods
8/4	Acceptance Testing
8/18	Modifications to Existing Systems
9/22	Topic Coming Soon
10/6	Seismic 101
10/20	Proposed Updates to NFPA 25, 2029 Ed.
11/3	Evaluating Fire Pump Flow Tests
11/17	Top 10 Tech Reviews
12/1	Designing Water Storage Tanks
12/15	Pump Room Layout

PROGRAMS

Feb 9 - Mar 5 Apr 20 - May 14 Aug 3 - Aug 27** Oct 26 - Nov 19	Beginning Design School*
Apr 26 - May 7 Nov 1 - 12	Intermediate Design School*
Feb 8 - 10** Apr 12 - 14 Jul 12 - 14 Oct 11 - 13	Sprinkler Hydraulics Calculations Workshop
Apr 19 - 21 Oct 18 - 20	Advanced Hydraulics Calculations Workshop
Feb 11** Apr 30 Jul 23 Sep 24	Introduction to the Fire Sprinkler Industry
Mar 1 - 3 May 17 - 19 Aug 16 - 18 Oct 18 - 20**	NFPA 25 Essentials Workshop
Jun 7 - 10 Sep 20 - 23	Experienced Inspector Skills Lab
Mar 4 - 5 May 20 - 21 Aug 19 - 20 Oct 21 - 22**	NFPA 25 Fire Pump Workshop
Spring Summer Fall	ITM Inspector Development Program* *This program is 20 months.*

** Hybrid course **At General Air Products Lab, Exton, PA*

AFSA46

September 8-11	Manchester Grand Hyatt San Diego, CA

For More Details Visit:
firesprinkler.org

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Dates subject to change. Programs subject to minimum registrations.

rev 9/14/2026

Virtual Instruction Path (VIP)

for Sprinkler Fitting Apprentices

Level 1 - Begins January 2027

Level 2 - Begins February 2027

Level 3 - Begins January 2027

Level 4 - Begins March 2027

www.firesprinkler.org/VIP

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HANDS-ON WORKSHOPS FOR 2027

FEATURING AFSA'S TRAINING LAB

NFPA 25 Essentials Workshop

Mar | May | Aug | Oct

Description: Understand roles, responsibilities, and NFPA 25 ITM procedures through hands-on testing of wet systems, dry systems, and fire pumps.

NFPA 25 Fire Pump Workshop

Mar | May | Aug | Oct

Description: Develop practical NFPA 25 fire pump ITM skills, including no-flow and full-flow testing, water supply graphing, and performance evaluation.

Introduction to the Fire Sprinkler Industry

Feb | Apr | Jul | Sep

Description: This course is designed for those new to the industry. An introductory, wide-ranging 8-hour course that provides a broad overview of core fire sprinkler industry concepts for those new to the field.

Experienced Inspector Skills Lab NEW

Mar | Sep

Description: Take your ITM expertise beyond the basics. Designed for experienced technicians, this course combines focused classroom instruction with hands-on system lab training to strengthen your application of current NFPA 25 inspection, testing, and maintenance requirements. Refine fire sprinkler testing practices, improve documentation, deliver more consistent service, and help reduce liability while reinforcing knowledge commonly covered on certification exams.

Learn more about AFSA's fire sprinkler lab featuring functional risers, a spray room, fire pumps, and an interactive classroom.

firesprinkler.org/lab