



# Viking OXEO Clean Agent Extinguishing Systems

Protecting Sensitive Areas with Clean Agent Fire Suppression

Presenter: Doug Meyers - Business Development for Special Hazards



Trusted above all.™

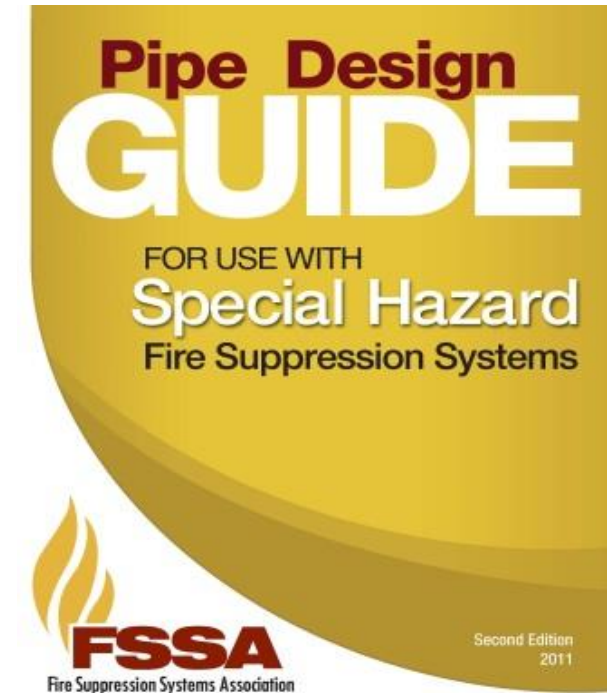
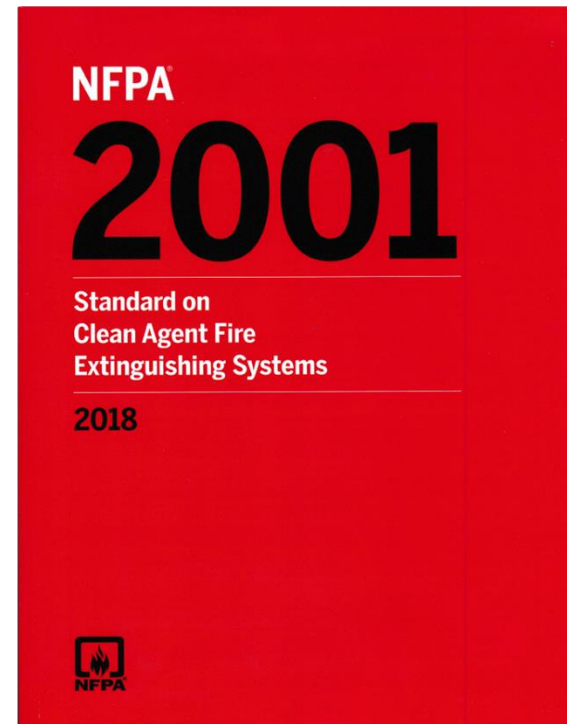
## What are Clean Agents?

NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems:

- 1.4.1.1 (2008) The fire extinguishing agents addressed in this standard shall be electrically nonconducting and leave no residue upon evaporation.

Two types of clean agents

- Synthetic Agents
- Organic Agents (Inert Agents)



# Changes in the industry over the last few years

## State of Clean Agents:

**2020** – **AIM Act** (American Innovation and Manufacturing) directed the EPA to reduce production and consumption of HFC's with Global Warming Potential which impacts HFC227ea (FM200) and other fire fighting extinguishing agents. <https://www.epa.gov/climate-hfcs-reduction>

**2020** – HFC227ea (FM200) and other fire fighting extinguishing agents with HFC's were added to the products Manufactures must **phase-down** due to global warming, with step down goals every 3 years in North America until 2034. Due to supply reductions agent costs will continue to rise.

**2022** – 3M announces it's exit from production of Novec 1230 (FK-5-1-12) and other products with **PFAS** per and polyfluoroalkyl.

**2023** **Viking** OXEO Inert **Clean Agent** Fire protection is introduced to the industry as a viable and sustainable solution.

# Synthetic Characteristics pertaining to the environment

## Halon 1301

- 65 years
- GWP 5600 – 6900

## (HFC 227EA) FM200

- 36.5 years prior to breaking down
- GWP 3200

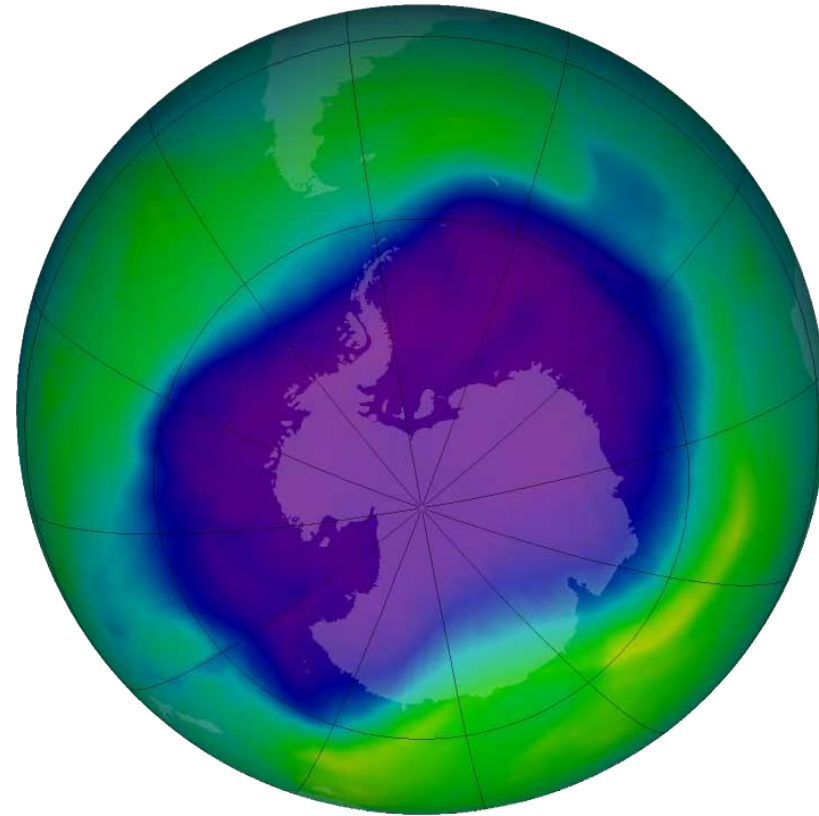
## (HFC 125) ECARO

- 29 years
- GWP 3500

## FK-5-1-12

- PFAS
- Less than 5 days Ozone
- GWP = 1

## Antarctic ozone hole recorded as of September 2006



## Inert Solutions: Zero Global Warming Potential & Zero Ozone Depletion

(IG – 01) Argon offered by Viking  
200 BAR (2901 psi) & 300 BAR (4350 psi)

(IG – 100) Nitrogen offered by Viking  
200 BAR (2901 psi) & 300 BAR (4350 psi)

### PRESSURE REDUCER SYSTEM

- 1-3 TANK SYSTEM

### NEW CONSTANT FLOW SYSTEM

- 4 OR MORE TANK SYSTEM



# Operation of Viking OXEO Clean Agent Extinguishing System



## Health and Safety Considerations

All Clean Agents recognized in NFPA 2001 must be evaluated and listed under the EPA – SNAP Program

Safety levels expressed by NOAEL and LOAEL designation

- NOAEL - No Observable Adverse Effect Level
  - The highest concentration at which no adverse physiological or toxicological effect has been observed
- LOAEL - Lowest Observable Adverse Effect Level
  - The lowest concentration at which an adverse physiological or toxicological effect has been observed.

**Table A. 1.5.1.3(c) Physiological Effects of Inert Gas Agents**

Agent	No Effect Level %	Low Effect Level %
IG-01	43	52
IG-100	43	52

# OXEO Inert Gas Clean Agent Systems

## FAQ

- 1. Do you need a vent for an Inert Gas system?
  - YES, Inert Gas systems (OXEO) are designed to push the Oxygen out of the room
- 2. Do I need additional safeties when using an Inert Gas (OXEO) system?
  - NO, as long as you follow NFPA 2001 (2022) Section 4.3.3.5. (Summarized Below)
  - Egress time study must be done per NFPA 2001 (2022) Section 4.3.4

Concentration %	Oxygen %	Egress Time/Exposure Limit	Required to be Normally Unoccupiable?
<43%	Approx. 12%	<5 minutes	No
43-52%	Approx. 10-12%	<3 minutes	No
52-62%	Approx. 8-10%	<30 seconds	Yes
>62%	Approx. 8%	<b>NO Exposure Permitted</b>	Yes



# VN Nozzles – PR & CF

## Pressure Reduced Design

Nitrogen (IG-100)	Nozzles VN TFI 360°	Nozzles VN TFI 180°
Nozzle cover surface	8.0 m × 8.0 m (26.3 ft × 26.3 ft)	10.6 m × 10.6 m (34.8 ft × 34.8 ft)
Maximum height	6.25 m (20.51 ft)	6.25 m (20.51 ft)
Minimum height	0.30 m (0.98 ft)	0.30 m (0.98 ft)
Minimum nozzle pressure	26.8 bar (388.7 psi)	27.3 bar (396.0 psi)
Design concentration, class A <small>Acc. to NFPA2001, UL2127, and FM5600</small>	37.98 vol.-%	37.98 vol.-%
Design concentration, class B <small>Acc. to NFPA2001, UL2127, and FM5600</small>	42.38 vol.-%	42.38 vol.-%
Design concentration, class C <small>Acc. to NFPA2001, UL2127, and FM5600</small>	42.73 vol.-%	42.73 vol.-%

Argon (IG-01)	Nozzles VN TFI 360° and VN TFI 180°	
	Nozzle cover surface: 8.0 m × 8.0 m (26.3 ft × 26.3 ft)	Nozzle cover surface: 10.6 m × 10.6 m (34.8 ft × 34.8 ft)
Maximum height	6.25 m (20.51 ft)	6.25 m (20.51 ft)
Minimum height	0.30 m (0.98 ft)	0.30 m (0.98 ft)
Minimum nozzle pressure	29.8 bar (432.2 psi)	31.0 bar (449.6 psi)
Design concentration, class A <small>Acc. to NFPA2001, UL2127, and FM5600</small>	49.31 vol.-%	52.52 vol.-%
Design concentration class B <small>Acc. to NFPA2001, UL2127, and FM5600</small>	57.98 vol.-%	61.75 vol.-%
Design concentration class C <small>Acc. to NFPA2001, UL2127, and FM5600</small>	55.48 vol.-%	59.09 vol.-%

## Constant Flow Design

Nitrogen (IG-100)	Nozzles VN 360°	Nozzles VN 180°
Nozzle coverage area	26.3 ft x 26.3 ft (8.0 m x 8.0 m)	26.3 ft x 26.3 ft (8.0 m x 8.0 m)
Maximum height	20.51 ft (6.25 m)	20.51 ft (6.25 m)
Minimum height	0.98 ft (0.30 m)	0.98 ft (0.30 m)
Minimum nozzle pressure	59.4 psi	201.6 psi
Design concentration, Class A*	35.4 vol.-%	33.48 vol.-%
Design concentration, Class B*	42.77 vol.-%	42.38 vol.-%
Design concentration, Class C*	39.83 vol.-%	37.67 vol.-%

Argon (IG-01)	Nozzles VN 360°	Nozzles VN 180°
Nozzle coverage area	26.3 ft x 26.3 ft (8.0 m x 8.0 m)	26.3 ft x 26.3 ft (8.0 m x 8.0 m)
Maximum height	20.51 ft (6.25 m)	20.51 ft (6.25 m)
Minimum height	0.98 ft (0.30 m)	0.98 ft (0.30 m)
Minimum nozzle pressure	104.4 psi	156.6 psi
Design concentration, Class A*	46.44 vol.-%	46.32 vol.-%
Design concentration, Class B*	55.13 vol.-%	55.12 vol.-%
Design concentration, Class C*	57.25 vol.-%	57.25 vol.-%

According to NFPA2001, UL 2127, and FM 5600

## What is the “Fire Triangle”

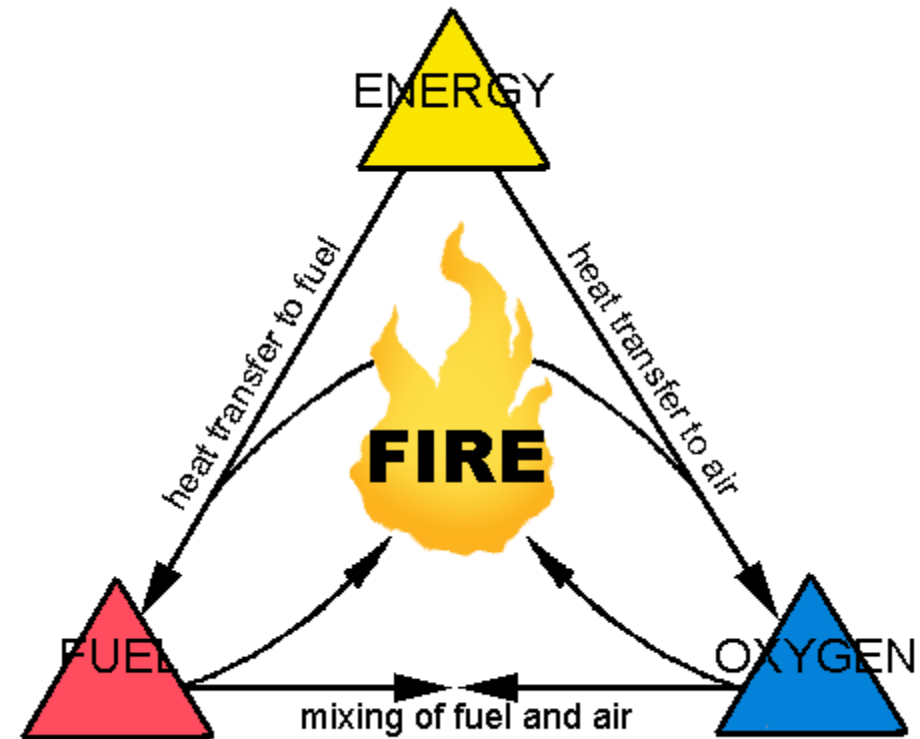
- Oxygen, Fuel, and Heat – with chemical reaction to create fire

### Inert Clean Agent Systems:

- Inerts reduce effective Oxygen Level from 21% to less than 12% by volume displacement also cooling the room

### Synthetic Clean Agent Systems:

- Synthetic Agents reduce heat source through chemical interaction (cooling the room)



## Why use Clean Agents?

### AHJ is concerned about:

- Life Safety/Property protection

### End User is concerned about:

- Business continuity
- Irreplaceable assets
- Cost / Benefit of Additional Protection
- Meeting Insurance Requirements



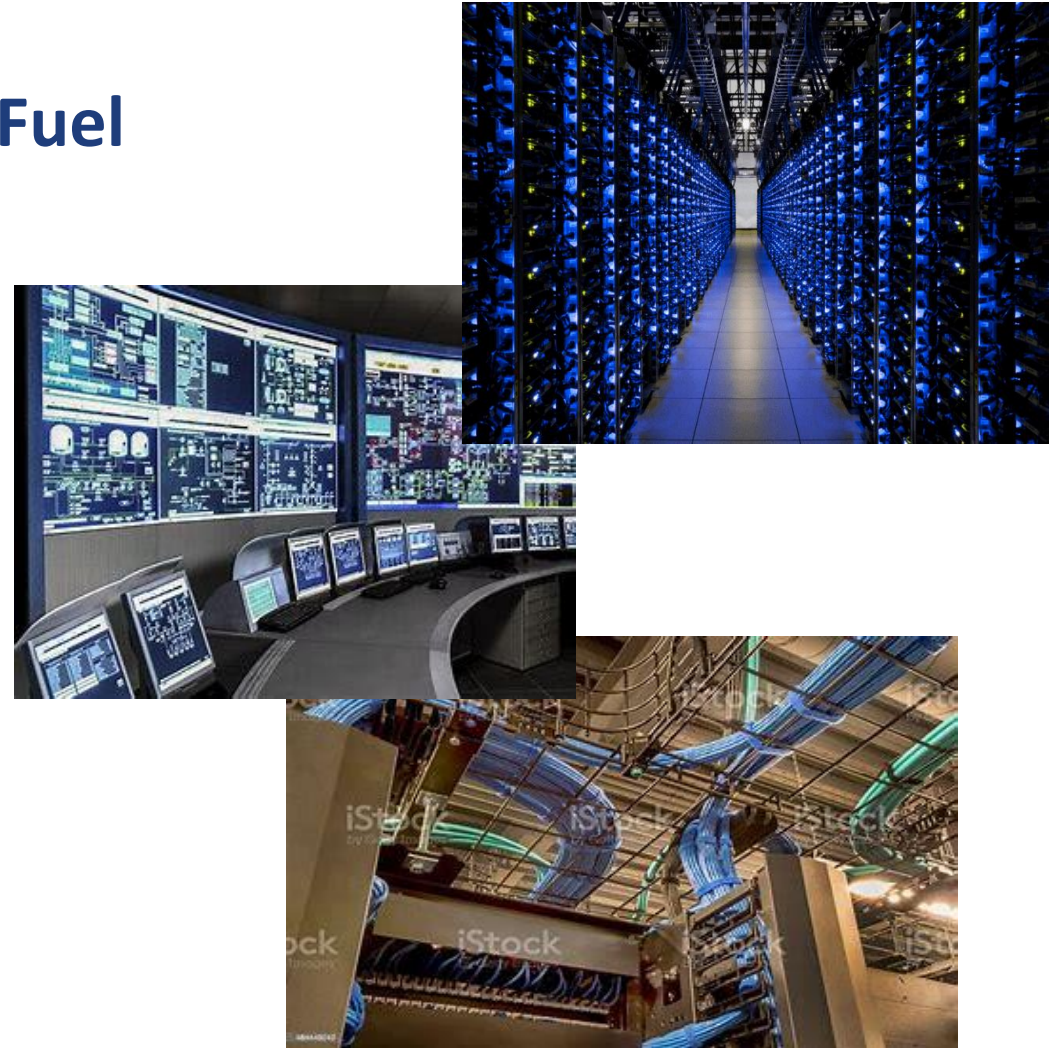
## Typical Clean Agent Applications – C Fire Fuel

### IT Infrastructure:

- Data Center (Open and Hot/Cold Isle)
- IT Distribution Closets
- Critical IT Pathways

### Critical Operational Infrastructure:

- Electrical Infrastructure
- Critical Operational Functions:
  - Control Room
  - Rack Room
  - UPS/Battery Rooms



## Additional Clean Agent Applications A Fire Fuel

### Valuable Assets:

- Rare Books
- Archive and Record Storage
- Museums
- Art Galleries
- Law Enforcement – Evidence Rooms



## Additional Clean Agent Applications B Fire Fuels

With approval through manufacture testing, inert gases are capable of being utilized for these applications

Design concentrations:

	IG-100 VN Nozzle	IG-01 VN Nozzle
Acetone	42.4	57.9
Aviation Gas	42.4	57.9
Benzene	42.4	57.9
Diesel No. 2	42.9	58.6
Ethane	42.9	58.6
Ethyl Acetate	43.6	59.5
Ethyl Alcohol	51.9	70.9
Heptane	42.4	57.9

# OXEO Class D – Argon (IG-01)

## Class D Applications: (not listed system)

- IG-01
- NFPA 484
- 80% Design Concentration
- 20 minute hold items
- No UL Listing/FM Approval

## Examples of install applications

- Lithium Ion Test Cells
- Magnesium Machining
- Aluminum Bag House
- Titanium 3D Printer

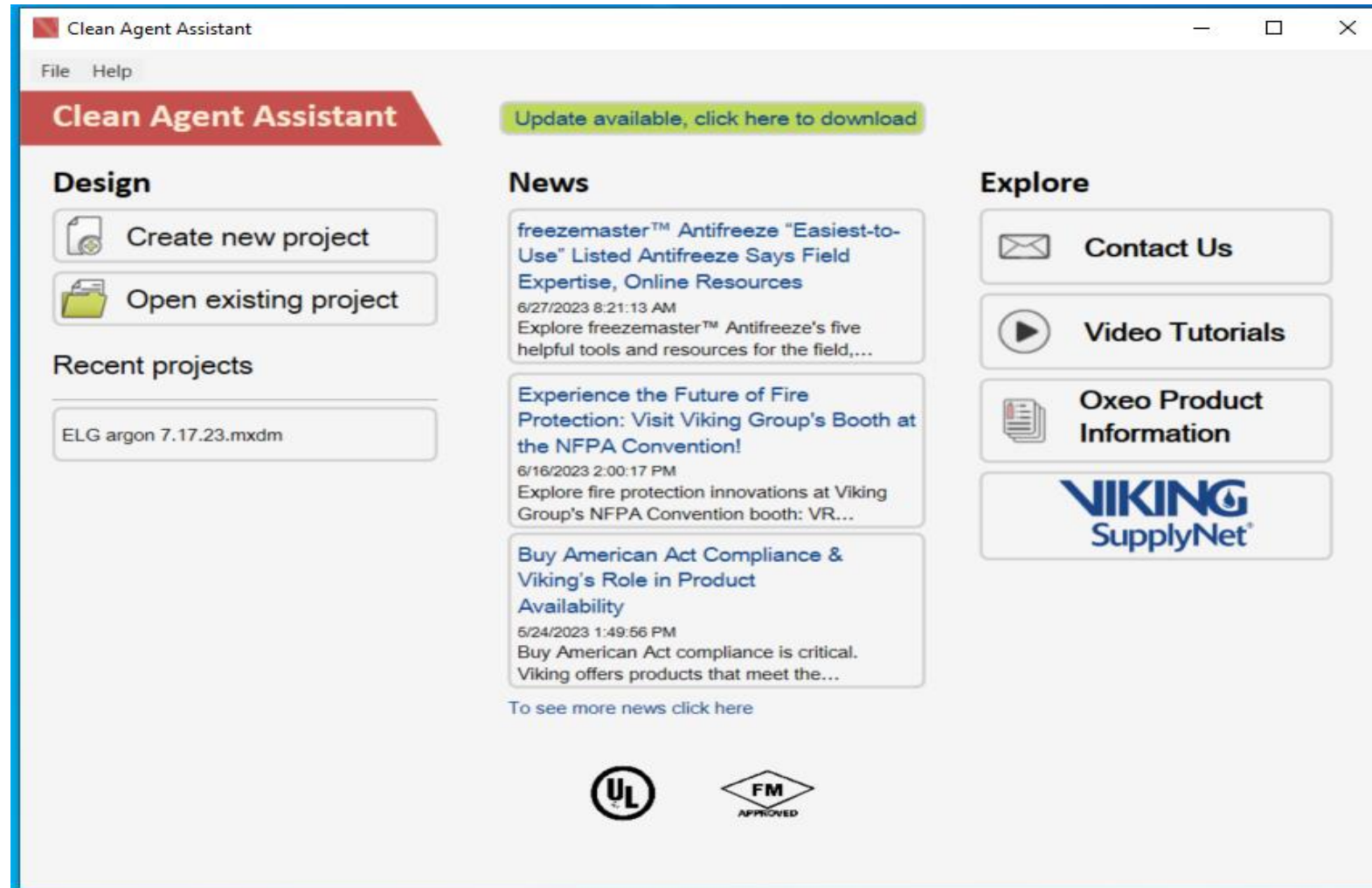


## How to Chose a Suppression Agent for Class D Hazards (NFPA 484):

Combustible Metals									
Agent	Alkali Metals	Lithium	Aluminum	Iron / Steel	Magnesium	Niobium	Tantalum	Titanium	Zirconium
Water	No	No	No	Yes	No	No	No	No	No
Foam	No	No	No	Yes	No	No	No	No	No
CO2	No	No	No	No	No	No	No	No	No
Nitrogen	Yes	No	No	Yes	No	No	No	No	No
Chemical Clean Agents	No	No	No	No	No	No	No	No	No
Argon	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes



# OXEO Design Manager Software for Design



# Filled OXEO Cylinder with Valve and Cap

Designation	Nominal Volume	Part no.
Oxeo Cylinder 2901 psi (Argon IG-01)	80.0 L	4001024
Oxeo Cylinder 2901 psi (Nitrogen IG-100)	80.0 L	4001044
Oxeo Cylinder 4351 psi (Argon IG-01)	80.0 L	4001030
Oxeo Cylinder 4351 psi (Nitrogen IG-100)	80.0 L	4001050

NOTE: To order cylinders in Canada, include the suffix "C" after any of the part numbers listed above (example: 4001024C)



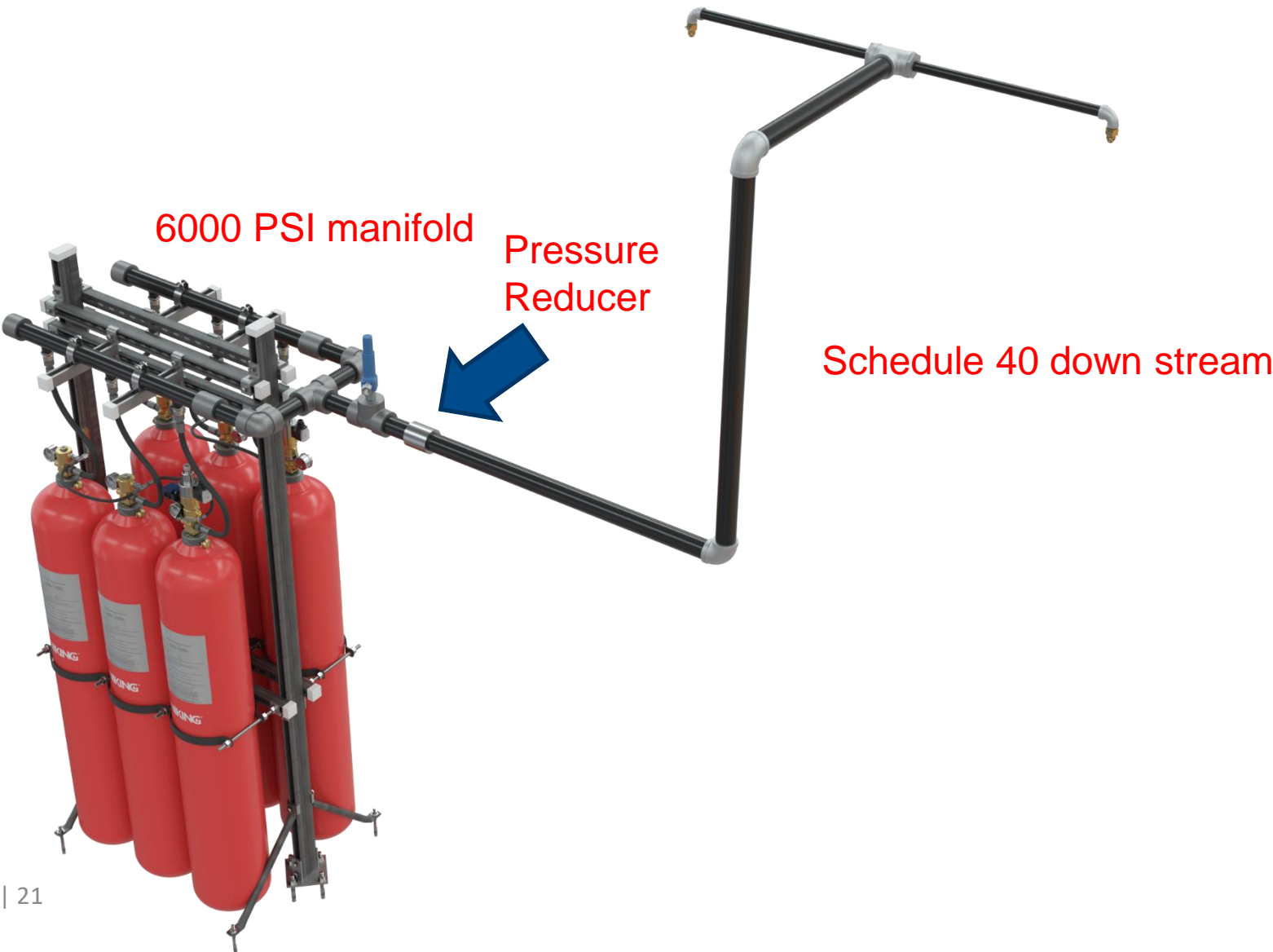
# Filled Oxeo Cylinder with Valve and Cap

# OXEO Pressure Reducer

- Orifice diameters range from 0.039" (1.0mm) to 0.114" (2.9mm)
  - Orifices are drilled at 0.1mm intervals. The inch conversions are rounded to the closest three decimal interval. See tech data for all available options.
- Orifice diameter indicated by four-digit suffix
  - XXXXX-0114 has a 0.114" (2.9mm) Orifice Diameter
- Available for in 4 different configurations
  - 3/4" BSPT Inlet / 3/4" NPT Outlet (Single Tank Systems Only)
  - 2" NPT Inlet / 2" NPT Outlet
  - 2" NPT Inlet / 2 ½" NPT Outlet
  - 2" NPT Inlet / 3" NPT Outlet
- A protective screen is press fit into the pressure reducer to avoid debris from plugging the hole



# System Layout – OXEO PR System



# OXEO Pressure Regulator

**The pressure regulator allows the high pressure from the 200 and 300 bar Nitrogen (IG-100) and Argon (IG-01) cylinders to be stepped down to below 800 PSI. This is our Constant Flow System (CF)**

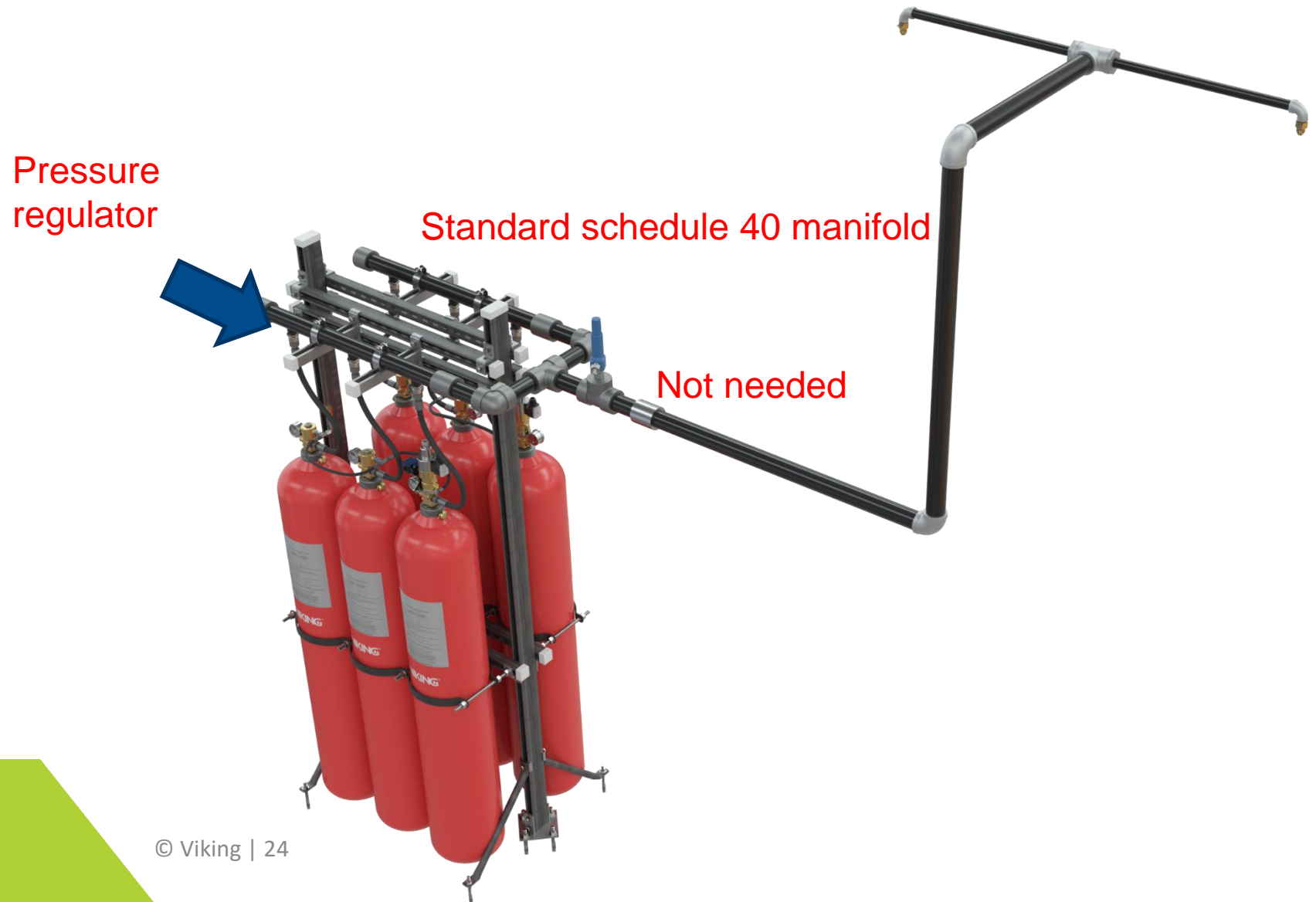


## OXEO Constant Flow Pressure Reducing

- At the hose prior to the manifold with pressure regulating

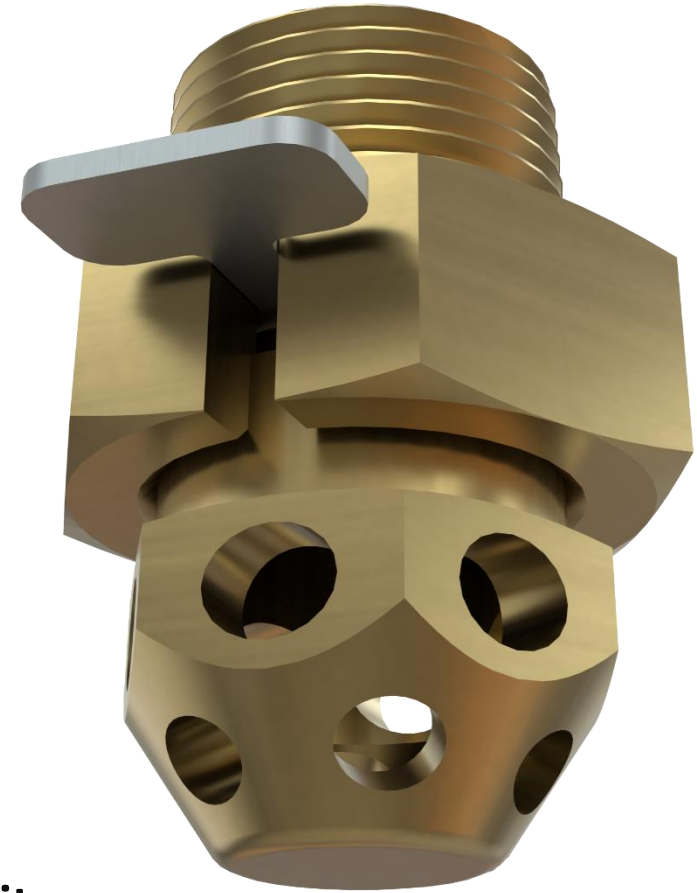


# System Layout – OXEO CF System





- Nozzle bodies and orifice plates are sold as a set
- Orifice plates are manufactured after a completed flow calculation has been performed
- Nozzle come in ½” to 1 ½” diameters

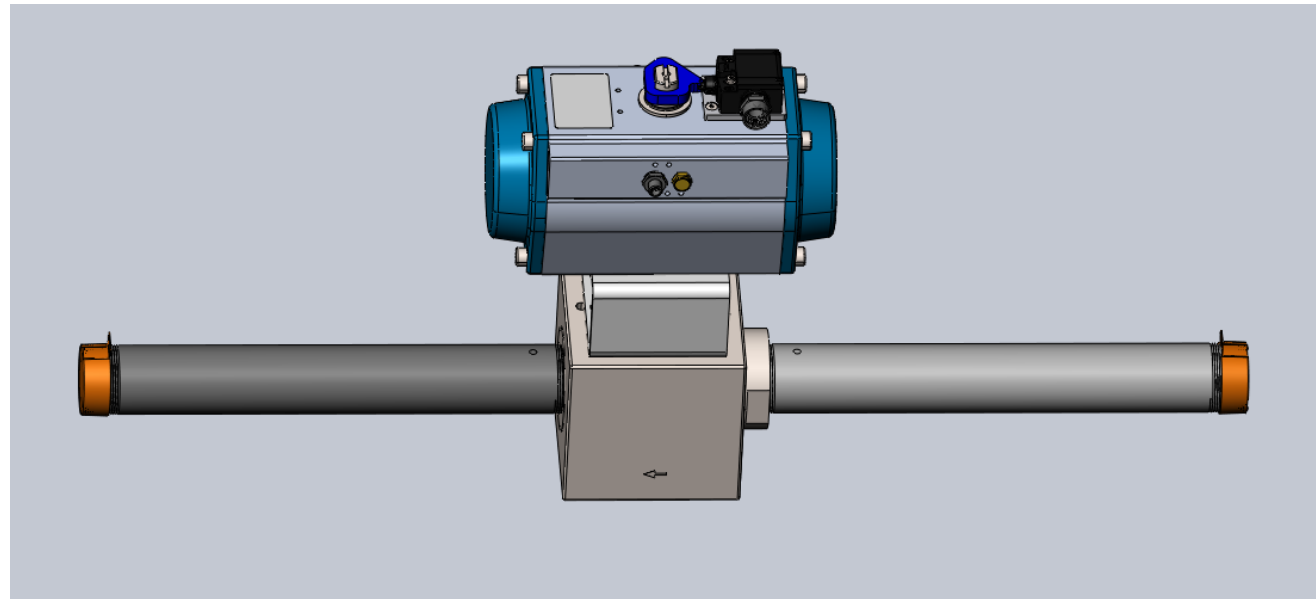


**Nozzle Kit**

# OXEO Selector Valve for Multi-Zone Applications

## 2" Selector Valve

- Pipe nipples installed to convert valve from 2" BSPT to 2" NPT
- Rated for both 2901 and 4351 PSI systems
- Only available in 2" NPT

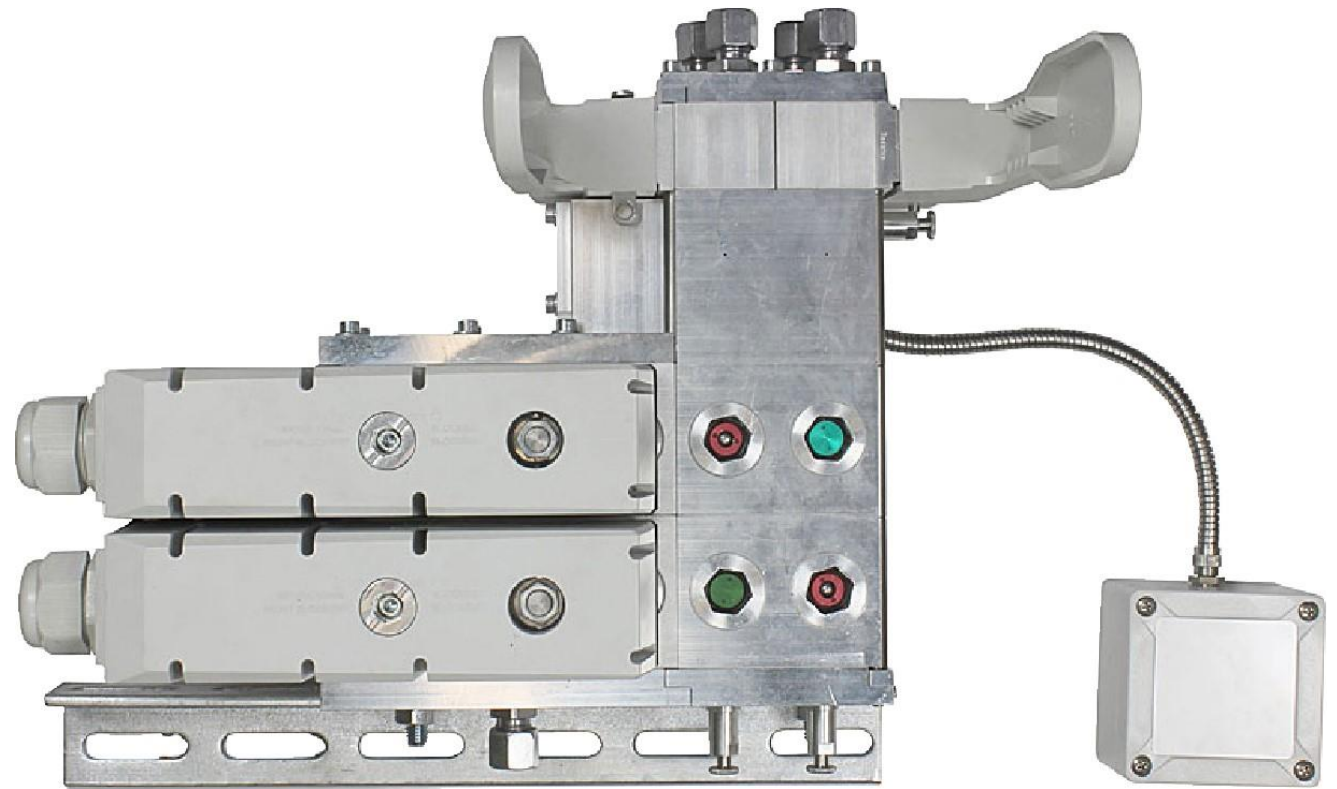


**Part Number - 24815**

# OXEO MZ-1 Control Unit

The control unit is a modular system  
Within a fire extinguishing system and is  
Used for triggering extinguishing zones  
and the accompanying zone quantities.

Part #930284



# Pressure Relief Vents by HVAC Trade

[www.amventco.com](http://www.amventco.com)



## Release Suppression Control Panel

- Releasing control panels that can be used on these systems must be UL listed with Viking Solenoid.
- Potter Release Control Panel



## General Characteristics of the System: Electrical

- Control Panel (Conventional or Addressable)
- Monitor and Control Modules
- Solenoid Release Interface
- Detection Devices (Smoke Detectors or Air Sampling)
- Manual Release Station(s)
- Manual Abort Station(s)
- Service/Maintenance Bypass Key-switch
- Notification Devices



# For More Information

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