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## Today's Agenda

•13:00 - 15:00

แนะนำผลิตภัณฑ์ FirePro

โดย บจก คอนไฟด์ เทคโนโลยี

• 15:10 - 17:00

<mark>ความรู้เกี่ยวกับ L</mark>ithium-ion Battery **และการป้องกัน** อันตรายจาก Thermal Runaway จาก Lithium-ion Battery

**โดย บจก PEC Technology (Thailand)** 

คุณเกษียณ สุขีโมกข์

• 17:30 - 21:00

จับรางวัลแทนการขอบคุณผู้มาร่วมงาน

ร่วมรับประทานอาหารเย็น





## กิจกรรมเพื่อสังคม **CSR**























































## FirePro.

Reinventing Fire Suppression

## Welcome to the world of

## FirePro.

The global leading manufacturer of Condensed Aerosol Fire Suppression Technology

#### FirePro.

P.

## **Our Mission**

Make the world safer by the use of our environmentally sustainable, and highly effective fire suppression technology.



**FirePro.** The global leading manufacturer of Condensed Aerosol Fire Suppression Technology

## FirePro. Company Profile

FirePro came to prominence in the fire fighting industry, following the Montreal Protocol finalized in 1987 and the Clean Air Act of 1990 on ozone depleting substances that banned the use of Halon 1301 fire extinguishing agent - the universally accepted and most widely used at the time.



- FirePro Systems Ltd established in 1996
- HQ & Manufacturing Facilities in Cyprus
- Distributors in 90 countries
- Installations in 110 countries



## **Distribution Network**

FirePro.

#### EUROPE

Albania Austria Belgium Bulgaria Croatia Cyprus Czech Rep. Denmark Fstonia Finland France Georgia Germany Greece Hungary Iceland Ireland Italv

Latvia Lithuania Luxembourg Malta Moldova Netherlands Norway Poland Portugal Romania Serbia Slovakia Spain Sweden Switzerland Turkev Ukraine United Kingdom

#### AMERICAS

Argentina Bolivia Brazil Canada Chile Colombia Ecuador Guatemala Mexico Panama Paraguay Peru Uruguay U.S.A. Bahrain Iraq Jordan Kuwait Saudi Arabia Lebanon Oman Qatar U.A.E.

**GULF** &

**MIDDLE EAST** 

#### ASIA & OCEANIA

Australia Bangladesh China Hong Kong India Indonesia Malaysia Myanmar New Zealand Pakistan Philippines Singapore South Korea Sri Lanka Taiwan Thailand Vietnam

#### AFRICA

Algeria Angola Botswana Congo Egypt Ghana Ivory Coast Kenya Mauritania Mauritius Morocco Nigeria South Africa Sudan Tanzania Tunisia

FirePro.

## FIGEPRO Acquired by Halma Group of Companies

# **Halma**

**Halma** is a global group of life-saving technology companies, focused on growing a safer, cleaner, healthier future for everyone, every day. Its purpose defines the three broad markets it operates in: Safety, Environment, Health.









#### Definition:

- Aerosol: A colloidal suspension of particles dispersed in air or gas(es)
- Colloids: Particles with diameter of a few microns nanometers

#### FirePro condensed aerosol:

- Minute solid particles of K<sub>2</sub>CO<sub>3</sub> (1-5 µm) suspended in a blend of inert gases (primarily N<sub>2</sub>, water vapor, CO<sub>2</sub>)
- 52% solid particles and 48% gasses





#### FirePro in Action – Total Flooding / Non-Pressurized System





## Solid Aerosol Forming Compound (FPC)

- Compact strong solid
- Certified lifetime 15 years
- Transformed into aerosol upon activation via an exothermic process
- Self-activation temperature + 300 °C





## Condensed Aerosol Generator Health & Environment



#### **Health & Environment**

FirePro.

FirePro is environmentally friendly and classified as a Green Product:

- •Zero Ozone Depletion Potential
- •Zero Global Warming Potential
- •Negligible Atmospheric Lifetime
- EPA SNAP listed as Halon alternative

Laboratory tests consistently demonstrate that the FirePro FPC has <u>no harmful effects on</u> <u>water, air, climatic conditions, animals, plants or micro-organisms</u>. FirePro has proven that it is possible to protect lives and assets while caring for the environment and a sustainable future for humanity.



#### **Green Policies**

FirePro has been assessed by GEN (Global Eco-labelling Network) and can carry the Green Label Certificate. The Global Ecolabelling Network (GEN) is a non-profit making association of Type-1 ecolabelling organizations as defined by the ISO 14024 standard.



#### **Green Chemistry**

The FPC solid compound, developed after many years of Research & Development, uses environment friendly, <u>naturally</u> <u>occurring Potassium salts with no pyrotechnic materials</u> involved. Our dedication to Green Technology and Sustainability is attested by the number and quality of EU and International Certificates, Listings and Approvals attained.



#### Non Ozone Depleting Substances

Our FirePro products are manufactured from environmentally friendly materials that at the end of their useful lifetime can be re-cycled or re-used without waste.

The physical and chemical characteristics of our FirePro products ensure that they pose no threat to the environment once they are activated.

They are Ozone-Friendly and contain NO CFC's, bear the 'Green Label' and are EPA-SNAP Listed (Significant New Alternative Policy) U.S.A.

## FirePro. Standard and Certificates Approvals Test Reports



## FirePro.

## **Condensed Aerosol Technology Standards:**



Organization International Organization for Standardization Standard ISO 15779:2011



Organization International Maritime Organization Standard IMO: MSC.1/Circ.1270



Organization European Committee for Standardization Standard EN 15276



Organization National Fire Protection Association Standard NFPA 2010



Organization UL - Underwriters Laboratories INC. Standard ANSI/CAN/UL/ ULC 2775



Organization KIWA NV Standard BRL-K23001



**Organization** Standards Australia **Standard** AS 4487-2013



Organization GOST - Russian Quality Standards Standard GOST R 51046-97 Fire Engineering Generators of extinguishing aerosol



**Organization** KFI - Korea Fire Institute **Standard** Guideline for the Automatic Condensed Aerosol Fire Extinguisher





## FirePro technology Listings & Approvals



Organization UL - Underwriters Laboratories Certification Protocol UL 2775 – Fixed Condensed Aerosol Extinguishing Units

Reference FWSA.EX6960



Organization ULC - Underwriters Laboratories of Canada Certification Protocol ULC/ORD-C2775-12 Fixed Condensed Aerosol Extinguishing Units

Reference FWSAC.EX6960



Organization BSI - British Standards Institution Certification Protocol BRL-K23001/05 Aerosol Generating Fire Extinguishing System Units

Reference Kitemark License Number KM 547633



Organization LPCB Loss Prevention Certification Board

Reference 1417a Issue:01



Organization Global Mark Certification Protocol AS 4487-2013 Condensed aerosol fire extinguishing systems

Reference 42783209BA28F38FCA257F5B00152E55



Organization KIWA NV Certification Protocol BRL-K23001/05 Aerosol Generating Fire Extinguishing System Units

Reference Product Certificate K21774



## FirePro technology Listings & Approvals



#### Organization

**UL - Underwriters Laboratories Certification Protocol** ANSI/CAN/UL/ ULC 2775 - Fixed Condensed Aerosol Extinguishing Units

Reference **FWSA.EX6960** 



#### Organization **KIWA NV**

**Certification Protocol** BRL-K23001/06 Aerosol **Generating Fire Extinguishing System Units** Reference Product Certificate K21774



#### Organization

CSIRO - Commonwealth Scientific & Industrial Research **Certification Protocol** 

#### AS 4487-2013 & UL 2775 Fixed Condensed Aerosol

**Extinguishing Units Reference** 

ActivFire Certificate of Conformity afp-2286



bsi

#### Organization **ULC** - Underwriters

Laboratories of Canada **Certification Protocol** ANSI/CAN/UL/ ULC 2775 -**Fixed Condensed Aerosol Extinguishing Units Reference FWSA7.EX6960** 

#### Organization

**BSI - British Standards** Institution

**Certification Protocol** BS EN 15276 Condensed aerosol extinguishing systems **Reference** Kitemark License Number KM 738886

#### Organization







Organization VdS Schadenverhütung GmbH

**Certification Protocol** VdS 2344:2014-07 & VdS 2562:2013-03 Reference G 622001



Organization **CNBOP PIB - Scientific & Research Center for Fire** Protection

#### **Certification Protocol**

UWB-0098

EN 15276-1:2019 Condensed Aerosol Fire Extinguishing **Systems** Reference Certificate of Constancy of Performance NR. 063-



Organization LPCB – Loss Prevention Certification Board **Certification Protocol** LPS 1656: Issue 1.0 Reference

1417a Issue:03 1417b Issue:02



#### Organization KFI - Korea Fire Institute **Certification Protocol** Guideline for the Automatic Condensed Aerosol Fire Sogong 15-23-1











#### Fire Extinguishment tests

- Wood Crib –Class A tests
- Polymeric Material: PP, ABS, PMMA
- N-Heptane Class B
- Minimum height / maximum height area coverage tests

#### **Performance Tests**

- General
- Discharge Test
- Temperature
   Measurement Test
- Mounting Device Test
- Rough Usage Test
- Vibration Test
- Pyrotechnic Reaction
   Containment Test
- Fire Exposure Test
- High Humidity Test

- Moist Hydrogen Sulfide Air Mixture Corrosion Test
- Moist Carbon Dioxide-Sulfur Dioxide Air Mixture Corrosion Test
- Salt Spray Corrosion Test
- Thirty-Day Elevated
   Temperature Test
- Temperature Cycling Test
- Aging Test



## FirePro in Action – FirePro Wood Crib Test Demo



## **Fixed Aerosol Standard**



Standard for Fixed Aerosol Fire-Extinguishing Systems

2020



NFPA 2010 Standard for Fixed Aerosol Fire-Extinguishing Systems

NFPA 2010, Standard for Fixed Aerosol Fire-Extinguishing Systems, 2020 edition, offers comprehensive criteria for helping to ensure that condensed aerosol systems and associated components perform as intended.

NFPA 2010 provides the guidance and information to assist in protecting electrical and telecom power equipment, server rooms, rail vehicles, machinery spaces, and other areas in which these extinguishing systems are utilized. The standard applies to designing, installing, operating, testing, and maintaining aerosol systems for total flooding applications. Provisions cover everything from listing, inspections, and approval to safety requirements and additional explanatory and reference material.



## **UL Certificate of Compliance**



Certificate Number Report Reference Date	EX6960 EX6960-20110729 2022-July-19
Issued to:	FIREPRO SYSTEMS LTD 8 Faleas Str Limassol CY 4101 CY
This is to certify that representative samples of	FIXED CONDENSED AEROSOL EXTINGUISHING SYSTEM UNITS
	See Addendum Page for Product Designation(s).
	Have been evaluated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL/ULC 2775, Fixed Condensed Aerosol Extinguishing System Units
	UL514B/CSA C22.2 No 18.3/NMX-J-017-ANCE, Conduit, Tubing, and Cable Fittings
Additional Information:	See the UL Online Certifications Directory at https://ig.ulprospector.com for additional information
This Certificate of Compliance indica report have met the requirements for Only the Authorization Page that refe provides authorization to apply the U	tes that representative samples of the product described in the certifica · UL certification. It does not provide authorization to apply the UL Mark. rences the Follow-Up Services Procedure for ongoing surveillance IL Mark.
Only those products bearing the UL I Follow-Up Services.	Mark should be considered as being UL Certified and covered under UL
Look for the UL Certification Mark on	the product.
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#### UL Product iQ\*

FWSA,EX6960 - Fixed Condensed Aerosol Extinguishing System Units Fixed Condensed Aerosol Extinguishing System Units 0

100960

8 Faleet Str Umasol, CY #101 Cyprus

Description	Part No.
erosol-generating anti-quickling system unit	23
rePro-condensed aerosol generator	19-2258
when condensed aerosol generator	HP-207
reino condensed aerosol generator	FP-405
when condensed aerosol generator	FP 407
refre condensed aerosol generator	FP-805
when condensed aerosol generator	FP-407
rePro condensed aerosol generator	FP-1005
when condensed aerosol generator	- RP-100
rePro condensed aerosol generator	FP-2005
who condensed aerosol generator	NF-200
whe condensed associl generator	FP-5005
witre condensed annexi ganamter	17-50F
who condensed aerosol generator	F9-1200
rePro-condensed aerosol generator	19-12005
who condensed aerosol generator	F9-12007
refro condensed aerosol generator	(P-1200TS
who condensed aerosol generator	FP-2000
mPro-condensed aerosol generator	19-2005
who condensed aerosol generator	FP-2007
refro condensed aerosol generator	1P-2000TS
who condensed aerosol generator	FP-3000
refro condensed aerosol generator	1P-3005
who condensed aerosol generator	FP-30007
rePro-condensed aerosol generator	19-3000TS
effes condensed aerosol generator	17 -030
efvo condensed aerosol generator	17-42005
refro condensed aerosol generator	19-42007
refre condensed aansei ganarater	19-43005
refro condensed aerosol generator	1P-5700
refre condensed aerosol ganarator	19-57005
wive condensed serves generator	49-5700F
refro-condensed aerosol generator	1P-570075
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ounting brackets, 40, 80 g	C40808951/C40808952/C4 8/8/R
ounting brackets, 100, 200, 500 g	C1 2-5ABS/C1 2-5RBV C1-2-5RB/C1 2-5AS/C-1-2-5V
ounting brackets, 2000, 3000, 1200 g	81220308907 81220308901A



ounting bracket, 4200, 5700-g

For Class A surface barring and Class 8 and C category hepericks not for use in hepericlass (classified) locations. Temperature range -54 to -54PC.

**IABRETS** 

## FirePro.

## UL Certified Aerosol Generators for Zone 2 Hazardous Areas



Frequency of Occurrence	Division System	Zone System	
Continuous	Close I. Division 1	Zone 0	
Intermittent Periodically	Glass I, DIVISION I	Zone 1	
Abnormal Condition	Class I, Division 2	Zone 2	

#### Fixed Condensed Aerosol Extinguishing System Units for Use in Hazardous Locations

#### FIREPRO SYSTEMS LTD

8 Faleas Str Limassol, CY 4101 Cyprus

Class I, Division 2, Groups A, B, C and D.

<u>บริเวณอันตรายประเภทที่ 1 แบบที่ 2 (Class 1, Division 2)</u> คือ บริเวณที่มีการใช้ก๊าซหรือของเหลวไวไฟใน ระบบปิดซึ่งไม่มีการรั่วไหล *นอกจากเกิดความเสียหายของภาชนะบรรจุหรือการทำงานที่ผิดพลาดของเครื่อง มืออุปกรณ์* และยังรวมถึงบริเวณที่อยู่ใกล้กับพื้นที่อันตรายประเภทที่ 1 แบบที่ 1 ซึ่งก๊าซหรือไอระเหยของสาร ไวไฟอาจถ่ายเทถึงกันได้ นอกจากนี้พื้นที่อันตรายประเภทที่ 1 แบบที่ 1 ซึ่งเมื่อได้ติดตั้งระบบระบายอากาศ เพื่อช่วยลดปริมาณสารไวไฟที่ผสมในอากาศอย่างเหมาะสม แต่อาจเกิดสภาพอันตรายได้เมื่อระบบระบาย อากาศขัดข้อง ก็จัดเป็นพื้นที่อันตราย แบบที่ 2 ด้วย



E525880



## LPCB Red Book Listing



## Manufacturing Plant for VdS-Approved products

FirePro.

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SONENT SYSTEM

DNV

ISO 9001=ISO 14001

CATION

## ISO 9001:2015 and ISO 14001:2015 Certified







Safety Integrity Level (SIL)

FirePro generators are found to be in compliance with the requirements of:

- SIL 2 with Hardware Fault Tolerance = 0 $\succ$
- SIL 3 with Hardware Fault Tolerance = 1 $\succ$

SIL is an indicator of probability that a system will fail to perform properly, thus a third-party certification is requested for Risk Management / Insurance purposes.

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WITH IEC EN (	51508:2010		Ĩ
with IEC EN	61508:2010		
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FirePro.
#### FirePro. KIWA Certified - Land Applications Product Conformity Certificate - BRL-K23001



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# European Electromagnetic Compatibility (EMC) Directive





## FirePro. Lithium-Ion Battery fire test (Netherlands - 2019)





### Test – Lithium-Ion Battery fire test (Netherlands - 2019)





#### Marine Listings & Approvals

#### Type Approvals by IACS Members



Organization ABS - American Bureau Of Shipping Certification Protocol IMO MSC.1/Circ.1270 - UL 2775



Organization BV - Bureau Veritas **Certification Protocol** IMO MSC.1/Circ.1270



Organization United Kingdom Maritime & Coastguard Agency Reference Certificate of Inspection & Test 25/05/2022

Local Marine Approvals



Organization European Certification Certificate of Compliance No. 15031995



Organization RS - Russian Maritime Register of Shipping Certification Protocol IMO MSC.1/Circ.1270



Organization CRS – Croatian Register of Shipping Certification Protocol IMO MSC.1/Circ.1270



Registro Italiano Navale Certification Protocol IMO MSC.1/Circ.1270



Registro Italiano Navale



Organization New Zealand **Register of Ships** Reference CSM 07020-03





# Marine Approvals

#### MED Approval (Wheelmark)

Organization:

BSI Group The Netherlands B.V. (Notified Body Number 2797)

**Type:** Certification Body

**Country:** International

**Description:** Wheel Mark in Compliance with MED 2014/90/EU

**Reference:** BSI/MED/3.46/755612 Module B & BSI/MED/PC/755614 Module D



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# Awards

#### **Organization:**



Association of Manufacturers of Power generating Systems (AMPS) Location: London, England UK Designation: AMPS Technology & Innovation Excellence Award 2021 Date: October, 2021



#### **Organization:**

**GBAF** Publications. International Awards Location: London, England UK Designation: Decade of Excellence Date: February, 2020

**Organization:** Security & Fire Excellence Awards SECURITY & FIRE EXCELLENCE AWARDS 2019 Location: London, England UK Designation: Active/Passive Fire Project of the Year Date: November, 2019

# MANUFACTURING

Manufacturing Technology Insights, International Awards Location: USA Designation: Solution Provider, TOP 10 Date: June, 2019

Organization:

#### **Organization: GBAF** Publications,





Organization: Cyprus Export Award Location: Nicosia, Cyprus EU Designation: Cyprus Export Award for Industrial Products 2014 and 2016 **Date:** 2014,2016



WINNER

**Organization:** European Quality Awards Location: Paris, France EU **Designation:** Production Quality Date: October, 2016

**Organization:** Skydd & Säkerhet Security Awards Location: Stockholm, Sweden EU Designation: New Product Introduction Date: October, 2015

#### **Organization:**



SICUR International Location: Madrid, Spain EU Designation: New Product Introduction Date: March, 2012



#### **Organization:** XVII FISP, FISST

& VIII Fire Show Location: Sao Paulo, Brazil **Designation:** Most Innovative Technology Date: August, 2008



Organization: British Standards Institute Location: Birmingham, England EU Designation: BSI Kitemark Date: February, 2009



Security

award.

#### Organization: **HISWA Holland Marine** Industry Location: Amsterdam, Holland EU Designation: Most Innovative Product Date: March, 2002





# Knowledge Of Fire Behavior



### **Tetrahedron of Fire**



**FirePro** 

#### Fire is a <u>chemical chain reaction</u> which takes

place with the evolution of heat and light. In order for a fire to take place there are <u>3 main</u> <u>ingredients that must be present: Oxygen, Heat</u> <u>and Fuel</u>. In chemistry we call the type of reaction that produces fire a combustion reaction.



#### Oxygen Source (Oxidizer)

Air contains about 21 percent oxygen, and most **fires require at least 16 percent** oxygen content to burn. Oxygen supports the chemical processes that occur during fire. When fuel burns, it reacts with oxygen from the surrounding air, releasing heat and generating combustion products (gases, smoke, embers, etc.). This process is known as oxidation.

#### Heat Source (Combustion Temperature)

Heat is the energy needed to increase the fuel's temperature to the point where sufficient vapors are produced for ignition to occur.

#### Fuel Source (Combustion Substance)

May be any combustible material. Can be a solid, liquid, or gas. Typically solids and liquids must be heated to the point where they are converted into a vapor or gas before they will burn.

### The Combustion of Wood







heat is lost from the burning

material

### How to Stop FIRE



#### **Eliminate Fuel Source :**

limiting fuel by removing potential fuel from the vicinity of the fire, removing the fire from the mass of combustible materials or by dividing the burning material into smaller fires that can be extinguished more easily



# How FirePro works

Fire Extinguishing Action

FirePro.



### FirePro neutralizes electrolyte decomposition gases



 $KOH + HF \rightarrow KF(s) + H2O$ 





### Ordinary Combustibles

e.g. wood, cloth, paper, rubber and many plastics.



e.g. Petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases.

# Electrical Equipment

Involve energized electrical equipment + I Li-lon

Fires involving Li-lon batteries

\* Fuel Combinations. For combinations of Class A and Class B fuels, the design application density shall be the value for the fuel requiring the greater design application density.





# Total Flooding Design & System Operation





# Design Principle (NFPA 2010 - UL 2775)

Land Applications		
m = V x da x fa		
$m = V \times [EAD \times (SF + fa)]$		



Fire Class	E.A.D (g/m³)	da = D.A.D (g/m³)
А	84	109.2
В	84	109.2
С	84	109.2

#### where:

m: Solid Mass of FirePro Compound (FPC) Required (g)V: Protected Volume (m<sup>3</sup>)da: DAD (Design Application Density) (g/m<sup>3</sup>)

EAD: Suppression Application Density (g/m<sup>3</sup>) SF: Safety factor (30%) = 1.3 fa: Additional Design Factors (%)



<b>Example :</b> $V = 1 m^3$
$M = V \times D \times Sf$
$M = 1 \times 84 \times 1.3$
$M = 109.2 \text{ gram} / \text{m}^3$



#### Condensed Aerosol Design Principle KIWA BRL-K23001 protocol for (Li-Ion Battery Rooms)

Land Applications		
m = V x ρ	Fire Class	D.A.D. (g/m³)
m = V x DAD	Class A	130
m = V x [EAD x SF x fa]	CES	

where:

m: Effective Mass of FirePro Discharged Aerosol Required (g)

V: Protected Volume (m3)

**ρ**: DAD (Design Application Density) (g/m3)

EAD: Extinguishing Application Density (g/m3)

SF: Safety factor (30%) = Consolidated within the DAD

fa: Additional Design Factors (%)

f: Efficiency Coefficient of the manufacturer's generator (%)

# FirePro.

#### Condensed Aerosol Design Principle (MSC/IMO Circ. 1270)

Marine Applications		
W = [V x q]/f		
m = [ V x q ]		
m = [ V x DAD ]		
m = [V x EAD x SF ]		

Fire Class	D.A.D. (g/m³)
Class A	120



#### where:

m: Effective Mass of FirePro Discharged Aerosol Required (g) W: Solid Mass of FirePro Compound (FPC) (g) V: Protected Volume (m<sup>3</sup>) q: DAD (Design Application Density) (g/m<sup>3</sup>)

EAD: Extinguishing Application Density (g/m<sup>3</sup>) SF: Safety factor (30%) = Consolidated within the DAD f: Efficiency Coefficient of the manufacturer's generator (%)



#### NFPA 2010:2020

- A thorough visual inspection of the area is sufficient.
- Observed unclosable openings must be taken into consideration in the design and detailed calculations of additional agent quantities based on the manufacturer's design manual.

Aerosol Compensation Required	Leakage	
0% Additional Aerosol after 0 min	0.000 % to 0.170 %	
30% Additional Aerosol after 4 min	0.170 % to 0.474 %	
50% Additional Aerosol after 2 min	0.474 % to 1.000 %	
LPS or Louvers or Contact the Manufacturer*	More than 1.000 %	Fir

# FirePro Leakage Prevention System (LPS)





#### **KEY FEATURES**

- Custom-made systems
- Automatic operation
- Lightweight and robust construction
- Operating temperatures: 0°C to +50°C
- IP rating: IP40
- High temperature resistant silica cloth (RS-600)
- Voltage: 24 VDC

#### FirePro. Condensed Aerosol Leakages – LPS System Leakage Prevention System

- Engineer a solution for covering (large) openings in projects where it is needed to minimize the aerosol leakage below the acceptable threshold levels in order to be able to propose applicable FP Aerosol fire suppression solutions
- Provide this capability as an extra solution and selling tool to our BDMs, partners/distributors and clients





### FirePro Leakage Prevention System (LPS)



# **Selection and Arrangement of Aerosol Generators**

#### Consider:

- volume to protect
- height of the volume
- obstacles in the protected area (e.g. beams, columns)
- safety distances

- Select the right number and model of generators
- → to provide the adequate agent
- Install the generators at high level, on the ceiling or the walls
- → withing their stream length
- Position the generators evenly
- → to provide uniform distribution of the agent





#### **Thermal Clearance**





# FP Models Characteristics (UL-2775)

Aerosol temperature and time of action								
		Discharge	Discharge	Discharg	e temperature (	∘C)	Discharge o	duration (sec)
Ref.	Model	outlets	length (m)	L1(m)	L2(m)	L3(m)	Min.	Max.
1	FP -20T	1	1.0	-	-	-	3	6
2	FP-20TH	1	1.0	-	-	-	3	6
3	FP-40T	1	1.0	-	-	-	4	8
4	FP-80T	1	2.0	-	-	-	4	8
5	FP-100S	1	1.0	-	-	0.2	5	10
6	FP-200S	1	2.0	-	0.0	0.3	5	10
7	FP-500S	1	2.0	-	0.1	0.5	5	10
8	FP-1200 /S/T/TS	1	3.5	-	-	1.5	15	20
9	FP-2000 /S/T/TS	1	3.5	-	-	1.5	15	20
10	FP-3000 /S/T/TS	1	3.5	-	0.6	2.0	15	20
11	FP-4200 /S/T/TS	1	5.0	-	0.99	2.3	15	20
12	FP-5700 /S/T/TS	1	8.4	-	0.6	2.3	15	20

L1 = Distance in meters between the outlet and the point where the temperature is < 400°C

L2 = Distance in meters between the outlet and the point where the temperature is < 200°C

L3 = Distance in meters between the outlet and the point where the temperature is < 75°C



# Aerosol Calculation Engineering Software (ACES)



- ACES is a web-based software for generating FirePro system designs.
- The user has the ability to perform calculations according to the required room dimensions and as per the desired standard.









### **Product Labels**



FirePro. osol Generating Fire guishing System Unit / Condensed Aerosol Pro Systema Ltd, an ISO 90012015 & MOR.











#### **FirePro HERO – Manual Aerosol units** FP-1000M, FP-500M, FP-200M







### **Range of Products – Conventional Series**



CYLINDRICAL TYPE MODELS	Solid Mass of FPC
FP-20T	20g
FP-20TH	20g
FP-40T	40g
FP-80T	80g
FP-100S	100g
FP-200S	200g
FP-500S	500g

BOX TYPE MODELS	Solid Mass of FPC
FP-1200 /T/S/TS	1200g
FP-2000 /T/S/TS	2000g
FP-3000 /T/S/TS	3000g
FP-4200 /T/TS	4200g
FP-5700 /T/S/TS	5700g

MANUAL MODELS	Solid Mass of FPC	
FP-200M	200g	
FP-500M	500g	
FP-1000M	1000g	



### **Range of Products – ATEX Series**

FirePro. ATEX Certified Aerosol Generators for Explosive Atmospheres





MODEL	Solid Mass of FPC		
FP-100T(2G-EX)	100g		
FP-200T(2G-EX)	200g		
FP-500T(2G-EX)	500g		

MODEL	Solid Mass of FPC	
FP-100EX	100g	$\left( \frac{2}{5} \right)$
FP-200EX	200g	
FP-500EX	500g	
FP-1200EX	1200g	ZONE 0, 1, 2, 20,
FP-2000EX	2000g	21, 22
FP-3000EX	3000g	
FP-4200EX	42000g	
FP-5700EX	5700g	




# FirePro Systems for Close Area

- LV Switch Rooms
- HV Switch Rooms
- Power Distribution Rooms
- Electrical Switch Rooms
- Server Rooms
- Warehouse
- Etc



# Typical System Configuration (NFPA 2010)



Provide sufficient time delay to allow personnel to evacuate prior system discharge

### Indicative System Configuration (NFPA 2010 - UL 2775)





- 3. Extinguish-ant Disablement Switch
- 4. System Abort Switch
- 5. Gas Release Sign
- 6. 2nd Stage Sounder (Horn Strobe)

- 7.1st Stage Sounder (Bell)
- 8. Heat Detector (Zone 2)
- 9. Smoke Detector (Zone 1)
- **10.Sequential Activator**
- **11.Aerosol Generator**
- 12.Interlock with extractor fans or fire dampers



## **Control Panels - For Room Total Flooding**

Model	Sigma XT / Delta FS	
Battery	24V (internal)	
Detection	Automatic Detectors	
Installed	External	
Monitoring	YES	
Output Signals	Various	
No. of Generators	40 maximum	
	(up to 360 master/slave)	
Re-usability	YES	
Listings	EN/ UL	

#### Where it can be used?

In large room enclosure(s)





























# FirePro Systems for Close Panel

- Electrical Panel
- Network Panel
- Control Panel
- Etc





# **Modular Controllers: FPC-1**

Model	FPC-1
Battery	4x 1.5V (internal)
Detection	LHD or Built in Heat Sensor
Monitoring	YES
Output Signals	NO
No. of Generators	2 maximum

#### Where it can be used?

- Spaces with no power supply
- Generator rooms
- Container enclosures
- Protection of shipped goods







# Modular Controllers: FPC-2 V2

Model	FPC-2	
Power Supply	24V (external) / Battery backed 24 \	
Detection	LHD or Automatic Sensors	
Monitoring	YES	
Output Signals	YES (2) Alarm or Fan cut off & Fault	
No. of Generators	4 maximum	
Isolation Key Switch	YES	
Electronic Filter	YES (EMF and voltage spikes shield)	

#### Where it can be used?

- Multiple electrical panels
- Specialized equipment (Kardex)





Max. 4 Generators





## Modular Controllers: FPC-4R V3

Model	FPC-4R V3	
Battery	3V (internal) or 24V (external)	
Detection	LHD (2 input terminals)	
Monitoring	NO	
Output Signals	YES (2)	
No. of Generators	2 maximum	

#### Where it can be used?

- Electrical panels
- Engine bays











## Modular Controllers: FPC-5V2

Model	FPC-5V2	
Battery	3V (internal)	
Detection	LHD (68, 88, 105°C) or Bi-metallic (60, 70, 80, 100°C)	
Installed	On generator	
Monitoring	YES (battery status)	
Output Signals	NO	
No. of Generators	1 for each	
Re-usability	Change upon discharge	

#### Where it can be used?

• Any enclosure to be protected only by 1 generator





# Stand Alone Systems: BTA (Bulb Thermal Actuator)

Model	BTA	
Rated Temp. Options	57, 68, 79, 93, 141, 182 °C	
Detection	Thermal	
Installed	On generator	
No. of Generators	1 for each	
Re-usability	Replace upon discharge	







#### Where it can be used?

Any enclosure to be protected only by 1 generator



### **Durable & Autonomous**



A complete fire detection and extinguishing system, using a temperature calibrated bulb device, without requiring batteries, cables, sensors or releasing panel.







### FirePro in Action – In cabinet solutions





### FirePro in Action – Small Enclosure Demo (With Obstacles)

FirePro.	





### FirePro: NO Storage – NO Pipes – NO Pressure









- ✓ Archives
- ✓ Cable Tunnels
- ✓ False Ceilings
- ✓ Raised Floors
- $\checkmark$  Wind Turbines
- ✓ Inverters
- ✓ Power Packs
- ✓ Electrical Panels
- $\checkmark$  Main Distribution Boards
- ✓ Switchgear
- $\checkmark$  Power Factor Correction
- ✓ Control Rooms
- ✓ Electrical Rooms
- ✓ Transformer Rooms
- ✓ Telecom Shelters
- ✓ Diesel Generator Rooms
- ✓ Storage Areas
- ✓ Laboratory Rooms

- ✓ Marine Engine Rooms
- ✓ Vehicle Engine Bays
- ✓ Heavy Vehicle Engines
- ✓ Railway Stations
- ✓ Rolling Stock
- ✓ Medical Equipment
- ✓ Processing Areas
- ✓ Pumps Rooms
- ✓ Boilers Rooms
- ✓ Chillers Rooms
- ✓ Burners Rooms
- ✓ Compressors Rooms
- ✓ Machine Tools
- ✓ Kitchen Hoods
- ✓ Bank Vaults
- ✓ Dangerous Goods
- ✓ First Responders



### **3D tour of a FirePro installation in a Transformer Room** (Chelsea and Westminster Hospital, UK)









### Renault Samsung Korea

Location: Asia Application: Electrical panels System Industry: Automotive







# BIGSOLAR

### Bioaerio Pellas / Big Solar

Location: Europe
Application: Electrical Panels

Industry: Renewable Energy Production





Chelsea & Westminster Hospital



#### Chelsea & Westminster Hospital-UK

Location: Europe Application: High Voltage Control Rooms Industry: Healthcare









# Electricity Authority of Cyprus

Location: Europe Application: Electrical Substations Industry: Power Distribution













#### AIRPORTS COMPANY SOUTH AFRICA



### Airports Company South Africa

Location: Africa

**Application:** Electrical Substations & Technical Rooms

Industry: Airports & Aviation







### **Toyota Motors**

Location: Asia Application: Engine Test Cell Industry: Automotive







#### Monumental Buildings -Netherlands

Location: Europe

Application: Attic / Technical Rooms
Industry: Monuments







### ICAP – UK

Location: Europe Application: Electrical & Battery Rooms Industry: Financial Services











Karelia Tobacco Company Greece

Location: Europe Application: Electrical Vehicles Charging Rooms & Electrical Panels Industry: Tobacco













### Eurostar International - UK

Location: Europe Application: Electrical & Battery Rooms Industry: Railway





### Application: Energy Storage Systems, Industry: Energy







### Kokam Co.

Location: Asia

**Application:** Energy Storage Systems, High Voltage Rooms

System Industry: Renewable Energy








#### Kokam Co.

Location: Asia

**Application:** Energy Storage Systems, High Voltage Rooms

System Industry: Renewable Energy







#### Samsung SDI – Korea

Location: Asia

Application: Energy Storage System
Industry: Custom R&D









#### **Mobility Scooter**

Location: Europe Application: Electric Vehicles System Industry: Custom R&D





# -FƏRSEA



#### ForSea - Aurora

Location: Europe

Application: Energy Storage Systems (ESS)

System Industry: Marine







#### Baltic 142 Canova

Location: Europe
Application: Marine Engine Rooms
System Industry: Marine











#### TU Delft University of Technology

Location: Netherlands Application: Lithium Ion Battery Storage System Industry: Custom R&D











## AMPD Energy

Location: Hong Kong Application: Lithium Ion Battery Storage System Industry: Custom R&D









### Pfizer - Egypt

Location: Africa
Application: Warehouse

Industry: Pharmaceuticals







#### Petrobras – Brazil

Location: Americas Application: Electrical Panels Industry: Oil & Gas Offshore







#### Glencore Mount Isa Mines - Australia

Location: Australia

**Application:** Power Transformer & Electrical Substation

Industry: Mining











#### Van Peperzeel -Netherlands

Location: Europe

**Application:** Containers for transporting Electrical Vehicles

Industry: Recycling











#### Agrowin -Netherlands

Location: Europe

**Application:** Dangerous Goods Warehouse

Industry: Agricultural Chemicals





# Application: Kardex Storage & Retrieval Systems – Electrical and Mechanical Compartments





# Cape Dorset

#### Cape Dorset -Canada

**Location:** Americas

Application: Diesel Generator Room
Industry: Power Generation









#### Wind Turbines

Location: Asia

Application: Wind Turbine – Nacelle Industry: Renewable Energy







#### The Canadian Coast Guard (CCG)

Location: Americas

Application: Marine Engine Rooms

Industry: Marine











#### INTERNATIONAL POLAR FOUNDATION





#### Princess Elisabeth Antarctica

MXXXX Trans

Location: Antarctica

Application: Various

Industry: Research Stations







# Dr.Reddy's



Location: Asia

**Application:** Processing, Electrical and Storage areas

Industry: Pharmaceuticals



PNH

Dr Rochty



# FirePro. Project information





Nakhon Si Thammarat International Airport





**RIVERPRO PULP & PAPER** 





Melissa Yacht (Catamaran - Marine)



#### Project Nakhon Si Thammarat **International Airport**





GENERATOR ROOM		ขนาดห้อง		ปริมาตรห้อง	FirePro Desig	Solid Mass of	
	กว้าง (เมตร)	ยาว (เมตร)	สูง (เมตร)	(ลบม)	EAD UL Standard	EAD UL Standard Factory Factor	
AREA 1	4.40	6.95	5.75	175.84	84.00	1.30	19,201.84
AREA 2	1.90	3.80	5.75	42.61	84.00	1.30	4,653.02
AREA 3	0.85	3.40	5.75	17.11	84.00	1.30	1,868.42
AREA 4	2.70	9.60	4.45	115.34	84.00	1.30	12,595.13
AREA 5	1.60	1.00	4.45	7.12	84.00	1.30	777.51
AREA 6	2.30	3.60	4.45	36.85	84.00	1.30	4,024.02
AREA 7	1.70	2.40	4.45	18.17	84.00	1.30	1,984.17
AREA 8	1.30	0.85	4.45	4.92	84.00	1.30	537.27
TOTAL AREA 1-8	-	-	-	417.96	-	-	45,641.38
	** 5	Solid Mass of com	pound Required = ป	ริมาตรห้อง × EAD U	IL Standard x Factory	Factor	
CULATOR LPS. LEAKAGE	OPEN AREA						
			v		<b>b</b>		

LPS. LEAKAGE OPEN AREA	กวาง (เมตร)	ยาว (เมตร)	มวาง + ยาว (เมตร)	ଶୃଏ ( เมตร)	บรมาดร (ดร.ม.)	
LEAKAGE OPEN AREA 1	3.80	10.00	13.80	0.02	0.276	
LEAKAGE OPEN AREA 2	6.80	4.00	10.80	0.02	0.216	
LEAKAGE OPEN AREA 3	6.80	2.00	8.80	0.02	0.176	
	0.668					

\* EAD = EXTINGUISHING APPLICATION DENSITY \*

ชื่อห้อง	Solid Mass of		Total Salid Mass				
	Compound Required	FP-5700	Sets	FP-3000	Sets	of Compound	
	กรัม	5,700.00	7	3,000.00	2	(กรม)	
GENERATOR ROOM	45,641.38	39,900.00		6,00	45,900.00		

ไม่มากกว่า 0.17% ของปริมาตรห้อง ไม่ต้องเพิ่ม Solid mass

<u>Material List</u>									
• FPC RP-2002E	7 Sets								
• FP-500	4 Sets								
• FP-1200	4 Sets								
• FP-2000	5 Sets								
• FP-3000	15 Sets								
• FP-5700	17 Sets								
• FP-LPS	4 Sets								



## FirePro. Project Nakhon Si Thammarat International Airport





0







AEROSOL FIRE EXTINGUISHING SYSTEM FOR MCC ROOM DIP - 5

20-0.755q.rvm, FRC TWISTED PAR WITH SHELD (1 ZONE 1 FOED TEMPERATURE OF 88°C, INFO: SEASURE CARLE (THER?INFR. 101) BB









ขนาดตู้ไฟฟ้า Solid Mass of FirePro Design Calculation ปริมาตร ชื่อตู้ไฟฟ้า Compound Required (กรัม) (ลบม) กว้าง (เมตร) ยาว (เมตร) สูง (เมตร) EAD UL Standard Factory Factor MCC ROOM TM5/1-3 1.05 22.10 84.00 9.70 2.17 1.30 2,413.32 \*\* Solid Mass of compound Required = ปริมาตรห้อง x EAD UL Standard x Factory Factor

\* EAD = EXTINGUISHING APPLICATION DENSITY \*

ชื่อตู้ไฟฟ้า	Solid Mass of		Total Solid Maso						
	Required	FP-200	Set	FP-100	Set	FP-80	Set	of Compound	
	กรัม	200.00	13	100.00	-	80.00	-	( กรม)	
MCC ROOM TM5/1-3	2,413.32	2,600.00		-		-	-	2,600.00	



AEROSOL FIRE EXTINGUISHING SYSTEM FOR MCC ROOM TM5/1 - 3 SCALE 1:40

<u>Material List</u>

• FPC - 4RM	57	Sets
• LHD	285	Metre
• FP-80T	11	Sets
• FP-100S	4	Sets
• FP-200S	84	Sets



AEROSOL FIRE EXTINGUISHING SYSTEM FOR MCC ROOM DIP - 7

## FirePro. Project Riverpro Pulp & Paper





Project Melissa Yacht (Catamaran - Marine)



<u>Material List</u>										
• FPC 10651	4	Sets								
• LHD	50	Metre								
• FP-100S	1	Sets								
• FP-500S	6	Sets								

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Boom Area		Room Dimension		Room Volume	FirePro Marine D (EAD UL	Solid Mass of		
	Required (g.)								
BATTERY ROOM 1	-	1.46	2.62	0.64	2.45	130.00	-	318.50	
BATTERY ROOM 2	-	1.46	3.12	0.64	2.895	130.00	-	376.35	
BATTERY ROOM 3	-	1.46	1.98	0.64	1.85 130.00			240.50	
CHARGER ROOM	Area 1	2.20	1.40	0.60	1.85	-	-	-	
	Area 2	2.20	3.50	0.80	6.16	-	-	-	
	Area 3	0.98	2.00	0.50	0.98	-	-	-	
	Area 4	2.20	1.32	(m.2)	2.90	-	-	-	
	Total Area 1+2+3+4	-	-	-	11.89	-	100.00	1,189.00	
** Solid Mass of compound Required = Room Volume x EAD UL Standard									

* EAD = EXTINGUISHING APPLICATION DENSITY *												
Protection Area	Solid Mass of		FirePro Generator					Total Solid Mass			<u>_</u>	.30
	Compound Required (g.)	FP-500	Effective mass (g.)	Sets	FP-100	Effective mass (g.)	Sets	of Compound (g.)			AREA 4 1.32 m2 x 2.2m = 2.9	9m3
BATTERY ROOM 1	318.50	500.00	330.00	1	-	-	-	330.00	8	AREA 1	/	
BATTERY ROOM 2	376.35	500.00	330.00	1	100.00	61.00	1	391.00	°	0.84 m2 x 2.2m = 1.85m3	2.8 m2 x	: 2.2
BATTERY ROOM 3	240.50	500.00	330.00	1	-	-	-	330.00				
CHARGER ROOM	1,189.00	500.00	500.00	3	-	-	-	1,500.00		1.40	4.90	3.5



CHARGER ROOM - SIDE VIEW



### FirePro. Project Melissa Yacht (Catamaran - Marine)





# FirePro. Modular Controllers: FPX-114 (Buses)





#### Boiler protection (open plan): Coca Cola factory, Hungary





#### Boiler protection (open plan): Coca Cola factory, Hungary





#### FirePro in Action – Fire Curtains Solution









### **Technology Advantages**



#### For the Client

- No Agent Storage Space needed
- No pressure tests required
- 15 years product life
- Safe for Humans & Environment

#### For the Designer

- Simple design
- Modular
- Fail Safe System

#### For the Installer

- No pressure integrity tests
- Simple & Fast installation
- No Piping

#### Thank You

