
SFPE
Engineering A Fire Safe World
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Technology Running Way Ahead of Fire Protection Code Development

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SFPE's Mission & Vision

To define, develop, and advance the use of engineering ***best practices***; expand the scientific and ***technical knowledge*** base; and ***educate*** the global fire safety community to reduce fire risk.

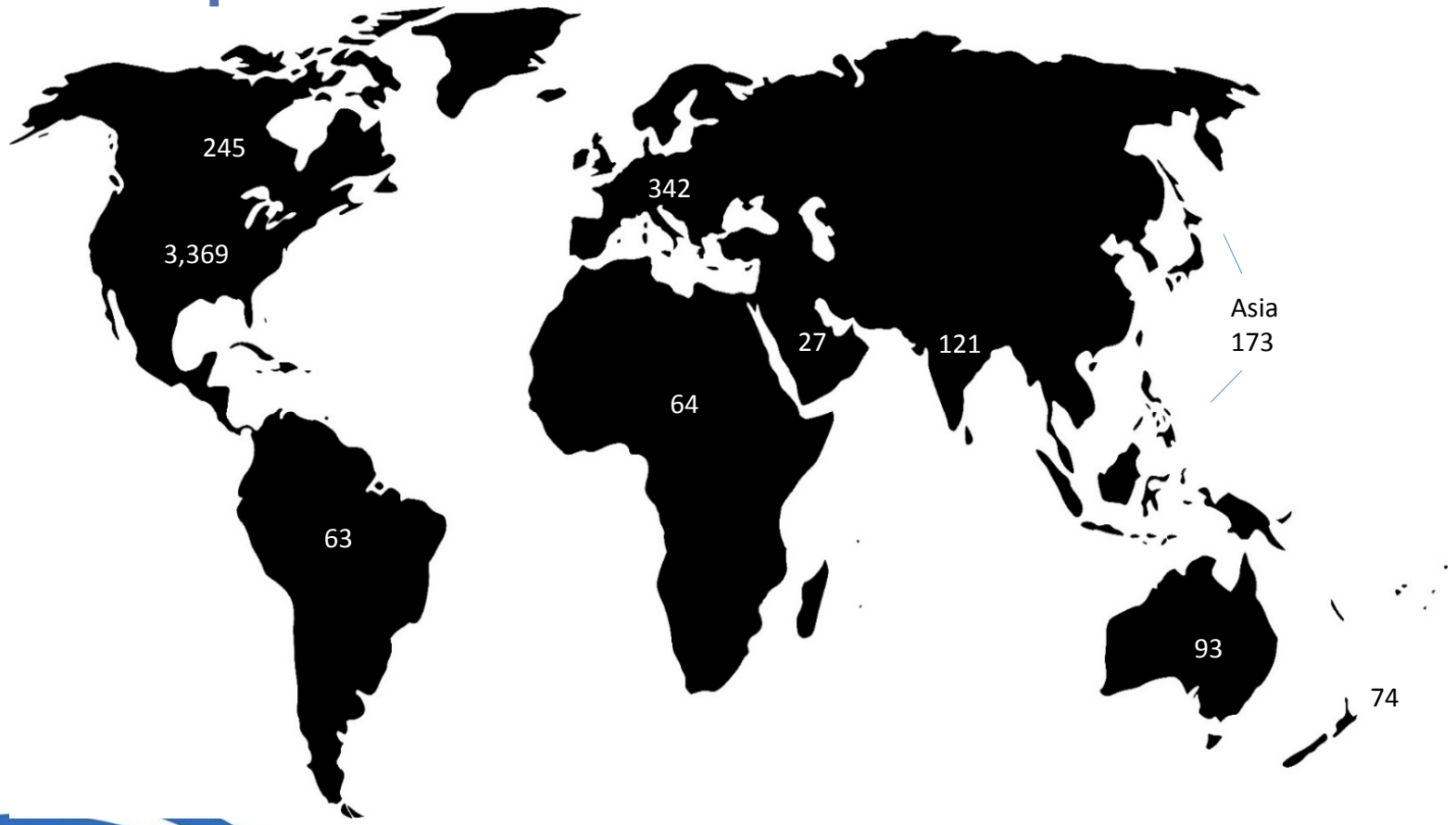
The leaders in engineering a fire safe world.

SFPE

Engineering A Fire Safe World

- Established in 1950 as part of NFPA
- Separated in 1971 and incorporated as a non-profit professional society
- Headquarters in Gaithersburg, MD
- $2.5 million annual operating budget
- 8.5 full-time staff

Global Membership (4,500+ members)
87 SFPE Chapters



SFPE's Strategic Plan Goals

1. Promote development, advancement and application of engineering methods
2. Advocate for the profession
3. Provide high quality services to members
4. Establish core competencies and roles
5. Develop, expand and promulgate technical knowledge base
6. Professional development and career growth

FIRE PROTECTION ENGINEERING PE ONLINE EXAM REVIEW

EARN 21 PDHs

14 LIVE, 1.5 HOURS ONLINE SESSIONS STARTING THIS JULY - OCTOBER

EVERY TUE	Jul. 11 - Oct. 10	2:30 - 4:00 PM Eastern Time
EVERY THU	Jul. 13 - Oct. 12	6:30 - 8:00 PM Eastern Time

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REGISTER AND FIND MORE DETAILS www.sfpe.org

77% who take this, pass the exam!

Dr Richard Gann, NIST
2000 HOTWC Keynote conclusions

Success in the delivery of fire safety has generally resulted from the compounded effectiveness of redundant tactics, e.g., fire resistant walls *plus* fire-retardant products. Performance-based codes are intended to reduce cost and improve design flexibility, both of which are easier to provide when including a fire suppression system. I thus expect that automatic fire suppression will become far more widespread than it is today. In particular, by the end of the 21st century, I expect we will at least see the following:

- Smart and early fire detection combined with next-generation fire suppression devices will ensure the quenching of most fires at non-hazardous levels and with no complications from nuisance alarms.
- All commercial and public buildings and spaces with contents of high or unique value will be protected with low volume water systems or systems based on a new generation of solid propellant gas generators (SPGGs) or next-generation clean suppressants.
- All new and renovated residences will have fixed central or localized suppression systems using the above technologies.
- In current dwellings that are still occupied and unrenovated 100 years from now, plug-in units, probably based on SPGGs, will be installed.

Technology Running Way Ahead of Fire Protection Code Development

- Specific Examples
  - Fire Protection of Data Centers and Telecommunications
  - Electronics Immersion Cooling
  - Energy Storage
- And, now, for something completely different…
  - Disruptive trend to affect the way we live
-

Emerging Fire Protection Challenges with Hot Aisle/Cold Aisle Containment in Data Centers

The Problem

FSSA
Fire Suppression Systems Association

Things are changing…

Significantly higher rack power densities

Saves on facility space

Supports blade server technology

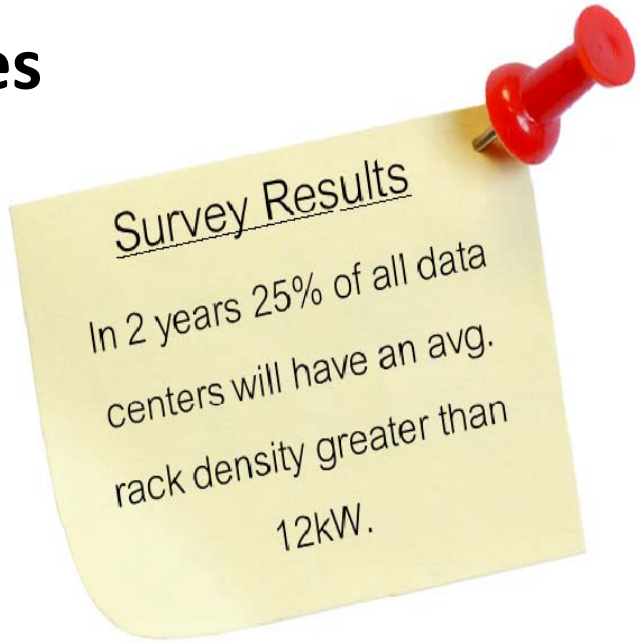
Contributes to reduced energy costs

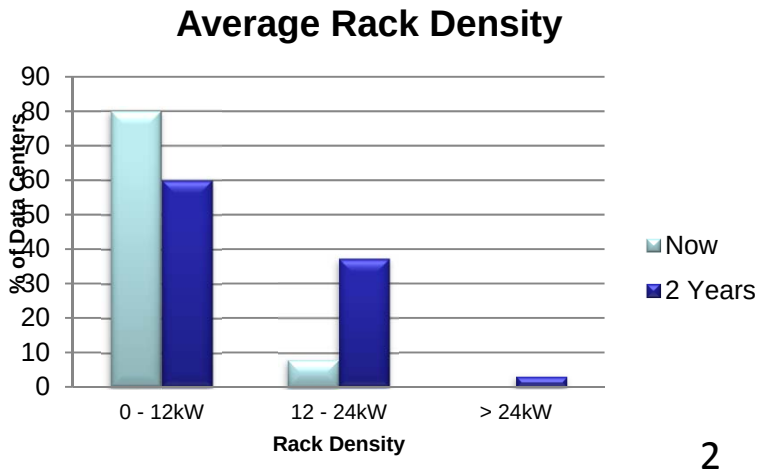
New cooling technologies

Supports high density computing

Improves cooling efficiencies

Challenging the performance of Fire Protection Systems





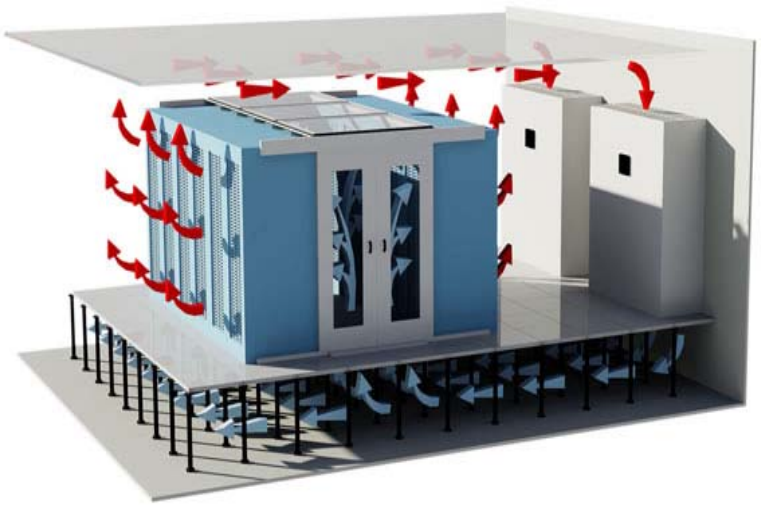
FSSA
Fire Suppression Systems Association

Cooling the Data Center

Cold Aisle Containment Systems

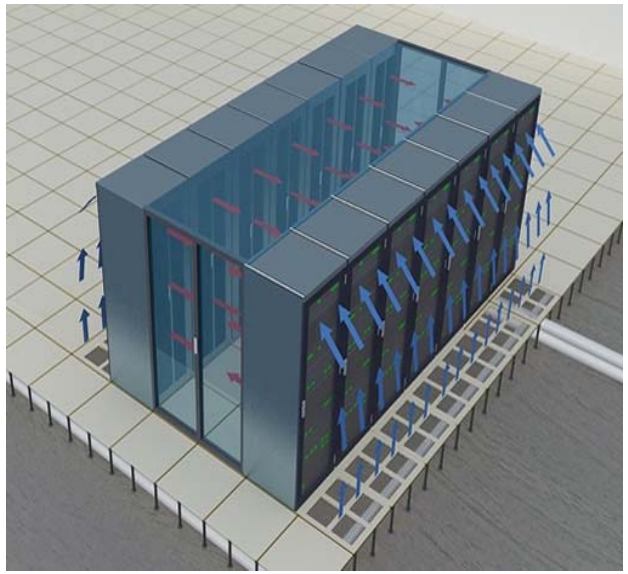
Position rows with “fronts” facing each other

Draw cold air from shared aisle



Hot Aisle Containment Systems

- Position rows with “rears” facing each other
- Exhaust hot air into shared aisle



FSSA
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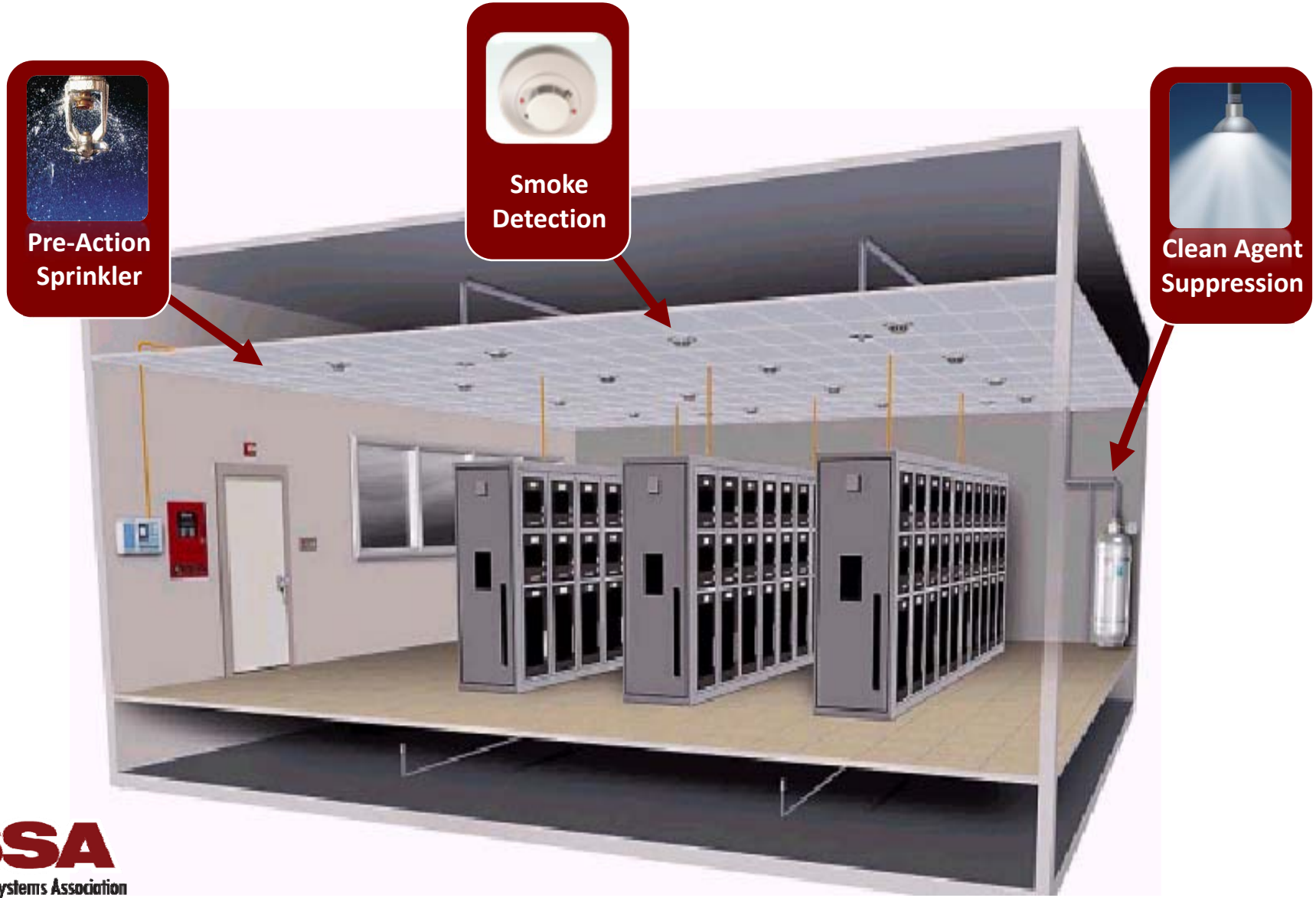
Fire Protection in the Data Center



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5 Fire Protection Challenges

Challenge # 1: **Obstructions**

Challenge # 2: **Inadequate automatic obstruction removal**

Challenge # 3: **Multiple areas of containment (separate volumes)**

Challenge # 4: **High temperatures**

Challenge # 5: **High airflow velocities**

FSSA
Fire Suppression Systems Association

NFPA 75

Standard for the Protection of Information Technology Equipment

New Section 5.7 Aisle Containment and Hot Air Collar Systems for ITE

Challenges addressed with 8 new requirements

FSSA
Fire Suppression Systems Association

NFPA 75

❶ Obstructions made with fire retardant materials

❷ HA/CAs not classified as plenum

❸ FP equipment must be rated for temperature max of hot aisles

❹ Retrofitted aisle containment: consider existing fire systems

❺ Sprinkler systems: address obstructions

❻ Sprinkler systems: automatic obstruction removal only if…series of conditions

❼ Gaseous suppression systems: Address aisle containment

❽ Gaseous suppression systems: automatic obstruction removal only if…series of conditions

FSSA
Fire Suppression Systems Association

Smoke Detection/Suppression Performance

Very High Airflow Rates

Possible 500 to 1,000 ACH

✓ *Dilutes smoke*

✓ *High velocity air movement*

Need for better design guidance

Fire Protection Research Foundation Projects – for high air flow conditions…

✓*Develop modeling tools to analyze detection performance.*

✓ *Quantify gaseous suppression performance.*

FSSA
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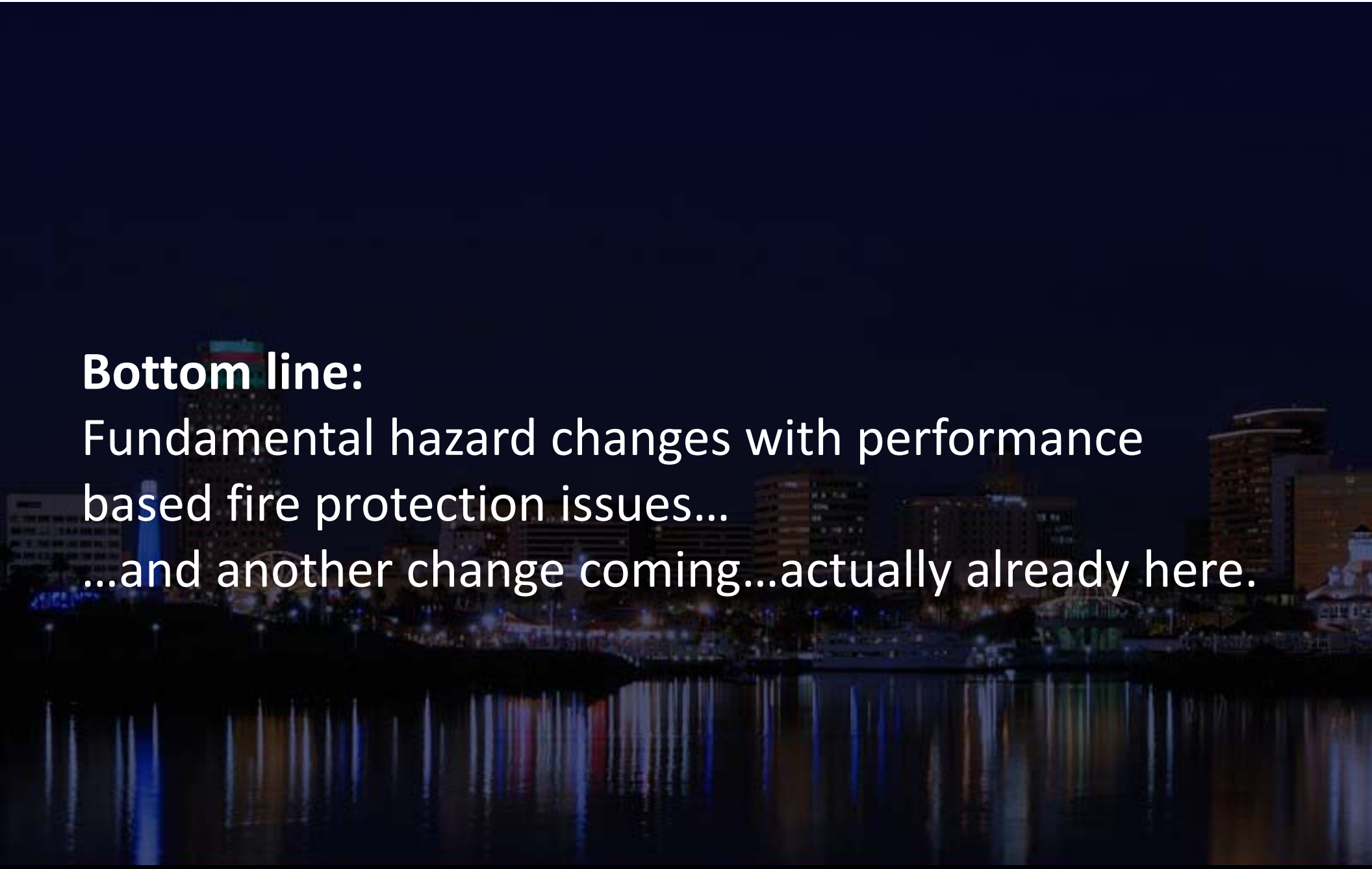


Bottom line:

Fundamental hazard changes with performance based fire protection issues…

…and another change coming…actually already here.

Situation Analysis

High density data center liquid immersion cooling.

Link

Current Data Centers

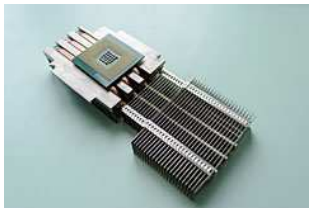
- Data centers account for about 2% of the planet's entire electricity consumption
- 30 billion watts of electricity (equivalent to 30 nuclear power plants are used for data centers
- Government and social pressure to reduce energy use from any source.

Traditional air cooling

- Inefficient thermal conductor, used as insulator
- Fans create a lot of noise and blow dust into IT
- Low density – wasted space
- Bulky heat sinks, thousands of fans, raised floors
- Energy-intensive and expensive computer room A/C (CRAC), 990 L/sec(1940 ft3/min) cooled air for 20kW/rack (APC)
- Excessive electricity need only to cool down IT hardware
- Power Usage Efficiency (PUE) is the ratio of facility electricity incl. cooling vs. IT electricity

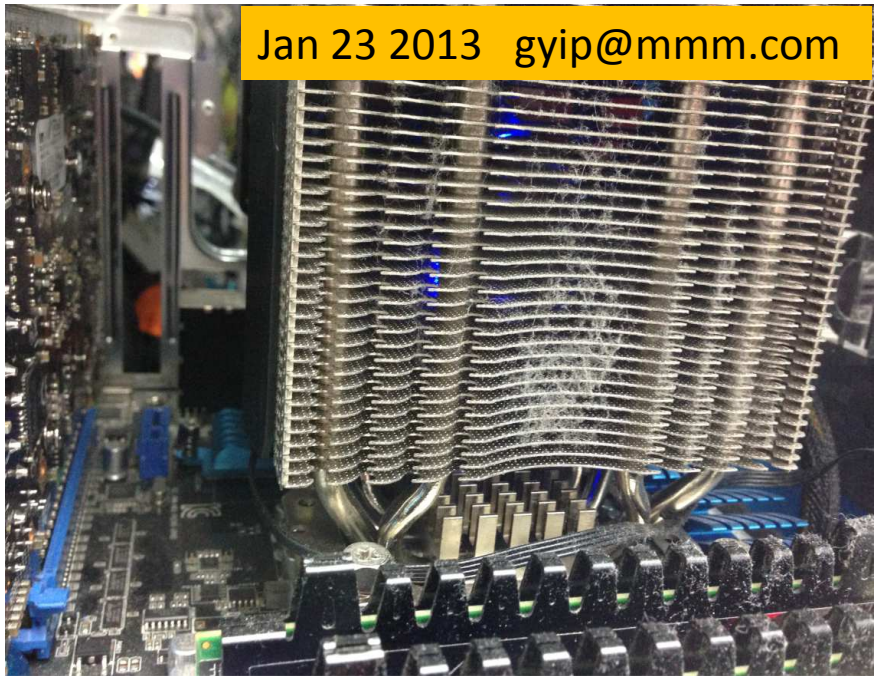
$$PUE = \frac{Pc + Pit}{Pit}$$

- Very inefficient and often PUE's of 2.0 (50% of electricity wasted on cooling etc.) in tropical climate.
- PUE = 1.0 is optimum.



Dust accumulation

Demo unit at computer shop



http://www.itworld.com/data-center/427813/data-centers-make-migration-liquid-cooling

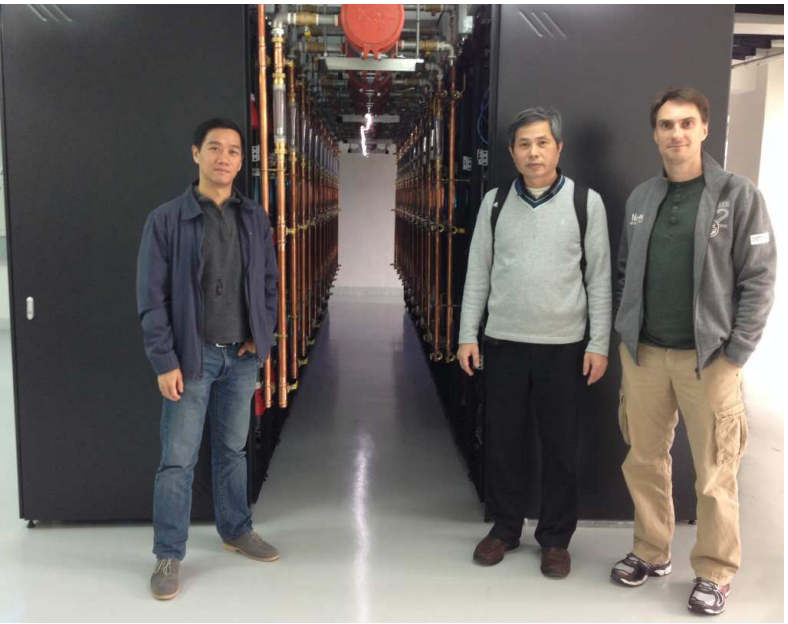
Data centers make migration to liquid cooling

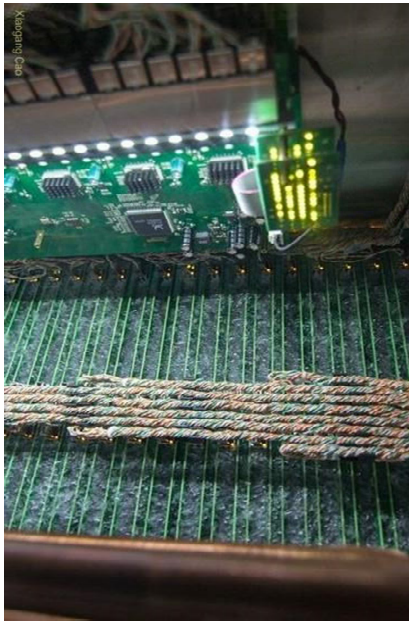
By **Andy Patrizio** **July 18, 2014, 11:38 PM** —

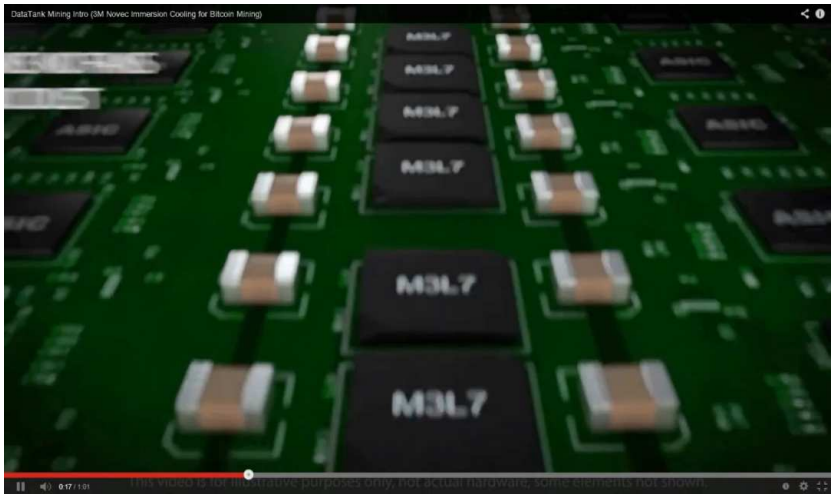
If you've ever been in a data center or computer room, you know it's not a fun place. Fans screech so loud you have to shout to have a conversation, and the computer room is kept at a frigid air temperature. That's air cooling for you.

An alternative is slowly, very slowly, creeping into the market. Market research firm IHS says in its new "Data Center Cooling Report—2014" that the market for liquid cooling infrastructure in data centers will grow by 40% this year to $2.3 billion. At that rate, this market will double in size in just two years.

500kW Immersion Cooling Data Processing System at Hong Kong







DataTank™ Container Unit 1.4MW
Modular Immersion Cooling System

http://www.datacenterknowledge.com/archives/2013/07/01/the-immersion-data-center/

The Immersion Data Center: The New Frontier of High-Density Computing
by Rich Miller on July 1, 2013

HOUSTON – As you enter the data center at **CGG**, the first thing you notice is what's missing – the noise and the breeze. Instead of rows of air-cooled black cabinets, the room is filled with tanks of liquid coolant, each containing up to 42 servers.
This is the new frontier of immersion cooling, with servers submerged in a liquid similar to mineral oil. It's also what a growing number of data centers may look like in coming years.

These tanks in the CGG data center in Houston are filled with 42 servers submerged in a liquid coolant, similar to mineral oil, developed by Green Revolution Cooling. (Photo: Rich Miller)

CGG's Houston data center is one of several hubs in its global network of 43 subsurface imaging centers. The company has shifted an entire data hall to an immersion cooling technology developed by **Green Revolution Cooling** (GRC). Instead of cool air flowing through a standing cabinet, the GRC system effectively tips the cooling paradigm on its back, with a liquid coolant flowing across servers housed in a tank.

Ever hear of ‘AI’?

Artificial Intelligence.

Legislative action – not all are in happy with concept of autonomous vehicles

House passed – to Senate for consideration

Date	Chamber	All Actions
09/07/2017	Senate	Received in the Senate and Read twice ar Committee on Commerce, Science, and T
09/06/2017-12:07pm	House	The title of the measure was amended. Agreed to without objection.
09/06/2017-12:07pm	House	Motion to reconsider laid on the table Agreed to without objection.
09/06/2017-12:07pm	House	On motion to suspend the rules and pass the bill, as amended Agreed to by voice vote. (text: CR H6667-6671)

NSPE™ NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

CALL TO ACTION

On Wednesday, September 6th the US House of Representatives will vote on HR 3388, the SELF DRIVE Act. The bill, if enacted, would make sweeping changes to current federal motor vehicle safety standards to accelerate widespread deployment of autonomous vehicles without human drivers. HR 3388 would allow automakers to obtain exemptions to deploy up to 25,000 vehicles without meeting existing auto safety standards in the first year, a cap that would rise to 100,000 vehicles annually over three years. NSPE has been a leading advocate on the need to place the public health, safety, and welfare first, and require a licensed professional engineer to play a key role in the development, testing, and safety certification of autonomous vehicles. This legislation fails to address the major safety, technological, and ethical challenges that have yet to be addressed before deployment of these vehicles should be considered. NSPE is therefore strongly urging defeat of HR 3388, the SELF DRIVE Act. Vote NO on HR 3388, the SELF Drive Act

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