OXEO Extinguishing System
proven technology made future ready

MFSI CC NAVY / Leonard Mix / NDC in Southamton UK

Agenda

1) **Company Introduction**
   - Timeline to Department
2) **History and Overview Gas Extinguishing Systems**
   - Trend & Comparison
   - Current developments
3) **OXEO CF marine System**
   - Function
   - System Design
   - Constant Flow Technology
4) **Synergies**
   - OXEO as part of a whole ship solution
5) **Q&A**

Minimax Fire Solutions Group – Your Partner for International Fire Protection Projects

Technology

- Unique range - whether water extinguishing systems, gas extinguishing systems, fire prevention systems or fire alarm systems
- Tested and certified components and systems
- In-house development and production facilities

Solutions

- Solutions for industrial fire risks and for special requirements
- Expert teams with many years of experience in fire protection

Services

- Extensive range of services with numerous local sites
- Maintenance and servicing for a long service life of fire protection systems

1900 1920 1940 1960 1980 1990 2000 2010 2016

1902

Founder Wilhelm Graaf patents his legendary "Spritztüte" (conical fire extinguisher). The Minimax brand is born

From Minimax fire extinguishers to the Minimax Fire Solutions International CC Navy

1900 1920 1940 1960 1980 1990 2000 2010 2016

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Founder Wilhelm Graaf patents his legendary "Spritztüte" (conical fire extinguisher). The Minimax brand is born

1929
The company "Selbsttätige Feuerlöschanlagen Gesellschaft" (SFH) is founded in Hamburg

1953
Minimax moves to Bad Urach and builds a factory for fire extinguishers

1968
Fire protection research center is inaugurated

1970
Minimax enters the global system integration market

1990s - today
Minimax establishes a designated Bussines Unit for Fire Fighting Systems on Ships

2005
Minimax acquires FLAMEX INC.

The fire extinguisher business is concentrated within Minimax Mobile Services GmbH & Co. KG

2007
Minimax incorporates Consolidated Fire Protection (CFP)

2009
Minimax and Viking merge, to become the Minimax Viking Group

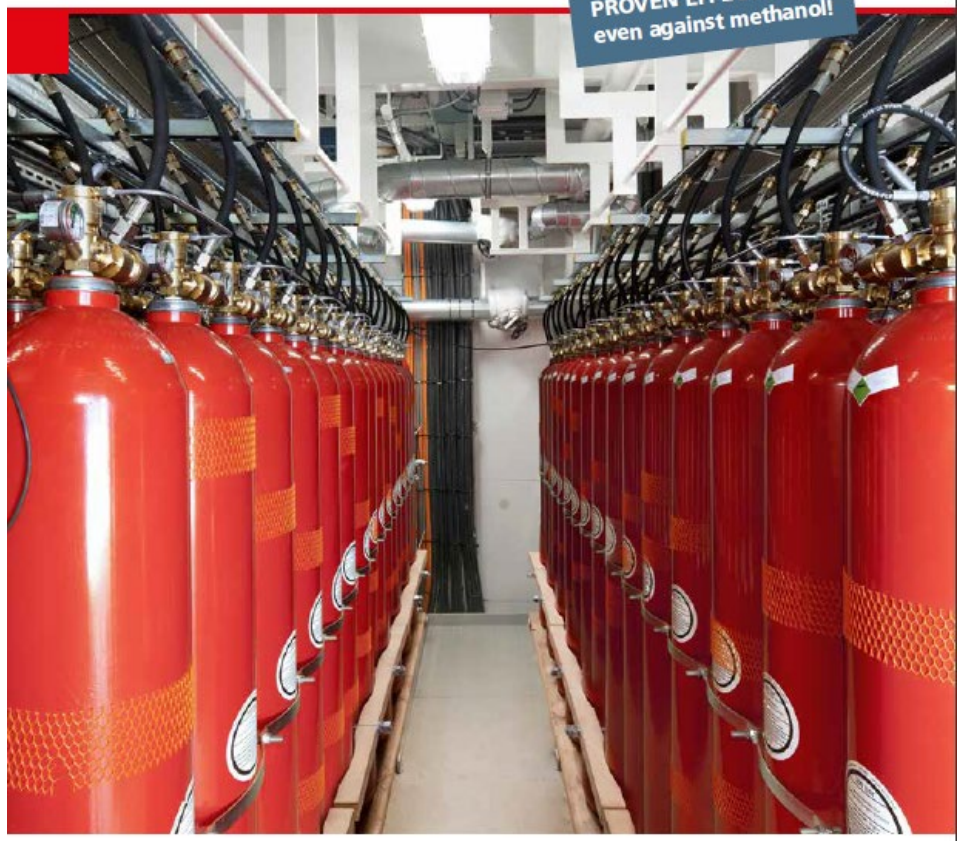
2016
Minimax Viking pools global system integration business within the Fire Solutions Group

2024
Minimax FSI GmbH Founding of new Competence Center dedicated to Fire protection Systems on board Naval Vessels
MFSI CC Navy

Comparison & Overview
Gas Extinguishing Systems

Experts in fire protection

Oxeo CF marine Systems



TECHNOLOGIES
GAS EXTINGUISHING SYSTEMS

Safety of crew

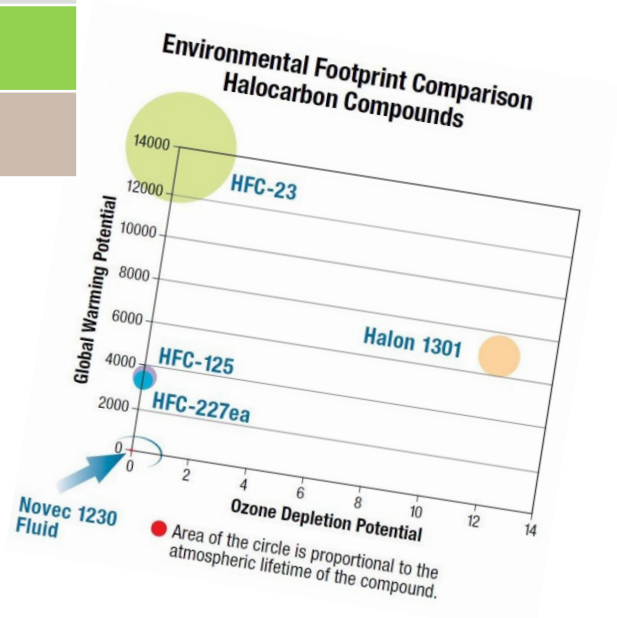
	Design-Concentration	NOAEL	LOAEL
CO_2	35 %	5 %	/
Halon 1301	5 %	5 %	/
Novec 1230	4,2 ~ 6 %	10 %	10 %
IG-100	42 %	43 %	52 %
IG-541	43 %	43 %	52 %

NOAEL = No observable adverse effect level

LOAEL = Lowest observed adverse effect level

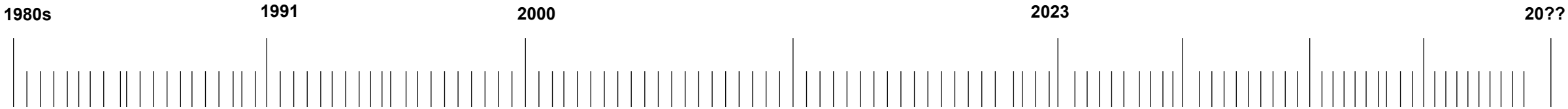
The long-term, sustainable solution

	Ozone depletion potential	Global warming potential	Atmospheric lifetime
CO_2	0	1	50 ~ 200 years
Halon 1301	10 ~ 16	6900	64 years
Novec 1230	0	1	3 ~ 5 days
IG-100	0	0	natural
IG-541	0	0,08	/

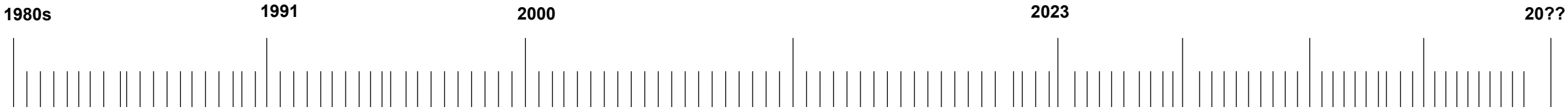


History and Overview
Gas Extinguishing Systems

CC Navy



History and Overview
Gas Extinguishing Systems



CO2

IG-Systems

HALON

1991
CFC are banned

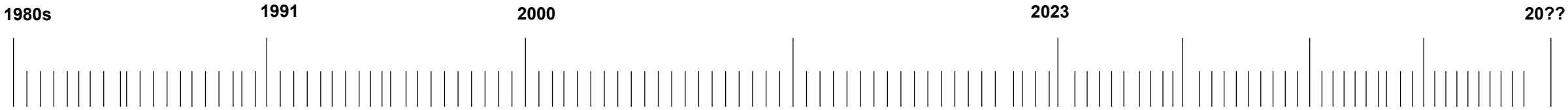
NOVEC 1230™

2023
PFAS restrictions discussed by EPA und ECHA
3M discontiniues NOVEC1230

FK-5-1-12 Systems

History and Overview
Gas Extinguishing Systems

CC Navy



CO2 →

?

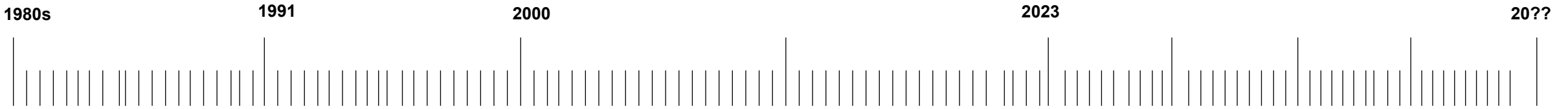
IG-Systems →

I[illegible]N → **1991**
CFC are banned

NOVEC™ 1230 → **2023**
PFAS restrictions
discussed by EPA
und ECHA

FK-5-1[illegible]2 Systems

History and Overview
Gas Extinguishing Systems



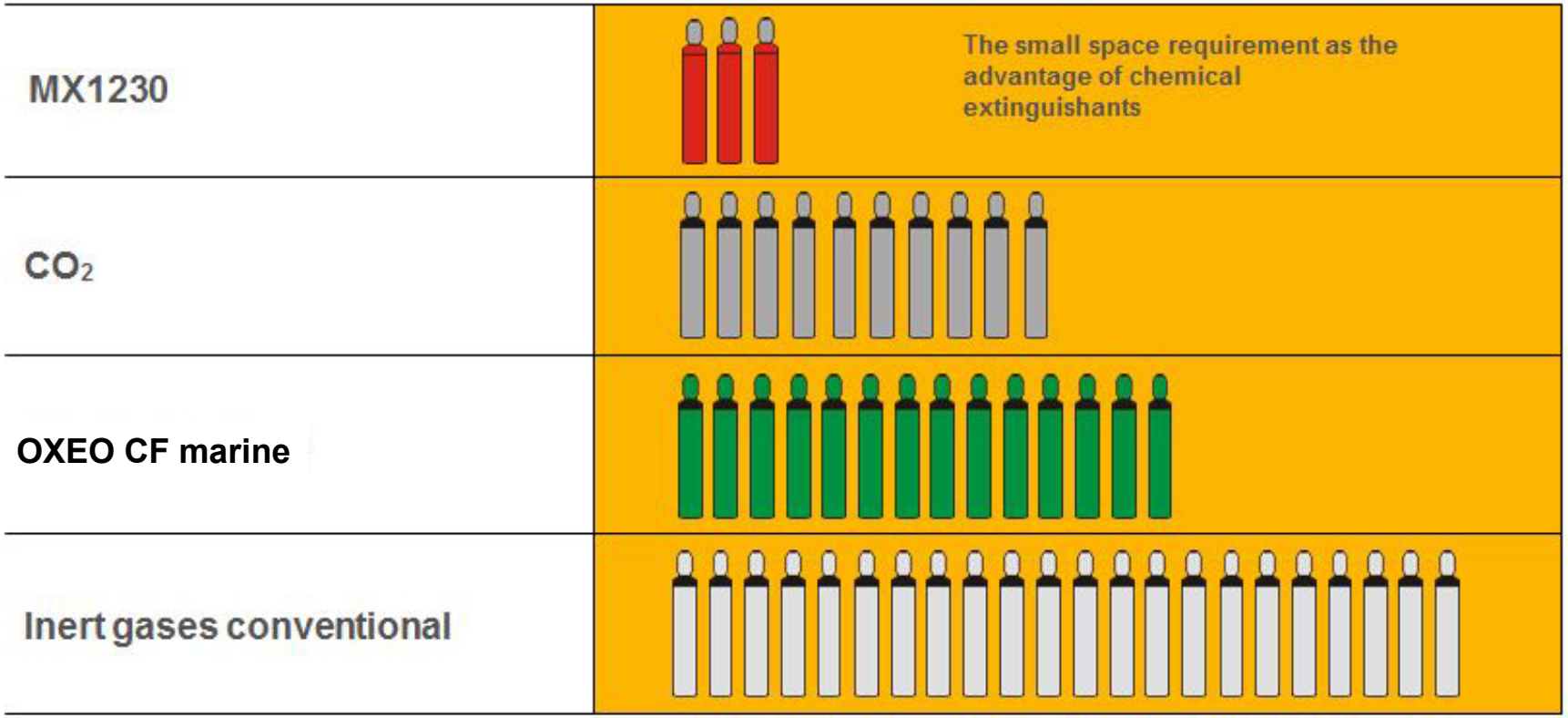
CO2 → ?

IG-Systems →

HALON → **1991** CFC are banned

NOVEC™ 1230 → **2023** PFAS restrictions discussed by EPA und ECHA → **FK-5-12 Systems**

Engineered to save valuable space



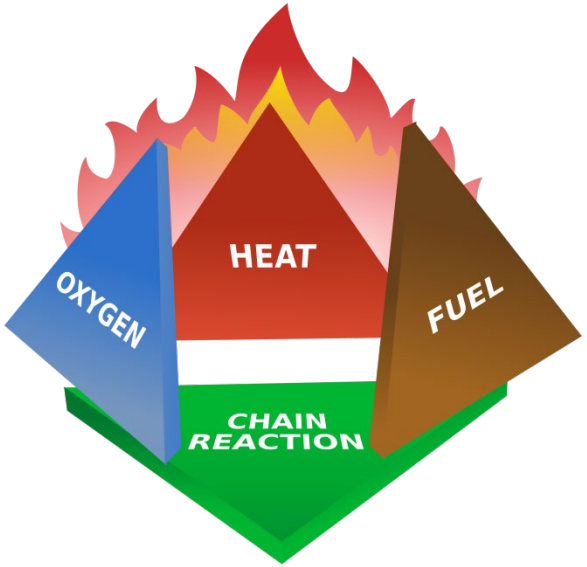
Example is for the same protected area

OXEO CF ma

Extinguishing performance of the OXEO CF marine System

The extinguishing performance of inert gas fire extinguishing systems is based on oxygen displacement,

To an small extend a extinguishing effect takes through cooling.



IG-100 – 100% Nitrogen

IG-541 – 52% Nitrogen 40% Argon 8% CO2

Extinguishing performance of the OXEO CF marine System

Table 1 Predicted and Measured Inert Gas Extinguishing Concentrations. Fuel: n-Heptane				
Agent[2]	MEC Pred. mol %	MEC Meas. mol %	Rel. Diff. %	$C_{P,\,298}$ J/mol-K
IG-01	42.4	42.5	0.2	20.8
IG-55	36.4	36.4	0.1	24.6
IG-541	34.2	34.3	0.4	26.1
IG-100	Ref.	31.9	-	28.5
N_2/CO_2:92/8	30.7	30.2	1.5	29.2
CO_2	22.0	20.9	5.2	37.5

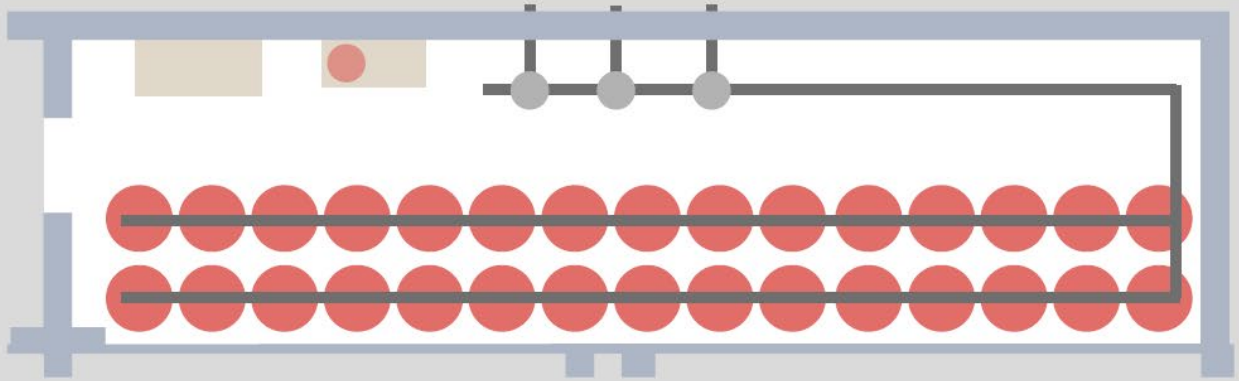
C.2 Auslegungskonzentrationen CF gem. IMO848

Extinguishing agent: IG-100 (Nitrogen)				
Nozzle type	Minimum nozzle pressure (bar)	Maximum nozzle coverage area (m^2)	Design concentration (vol. %) *	Maximum room height (m)
VN TFI 180°	15.7	50	42.0	5.0
RD	16.2	25	44.6	
Extinguishing agent: IG-541 (Inergen)				
Nozzle type	Minimum nozzle pressure (bar)	Maximum nozzle coverage area (m^2)	Design concentration (vol. %)*	Maximum room height (m)
VN TFI 180°	16.5	50	43.9	5.0
RD	15.2	25	45.1	

OXEO CF marine

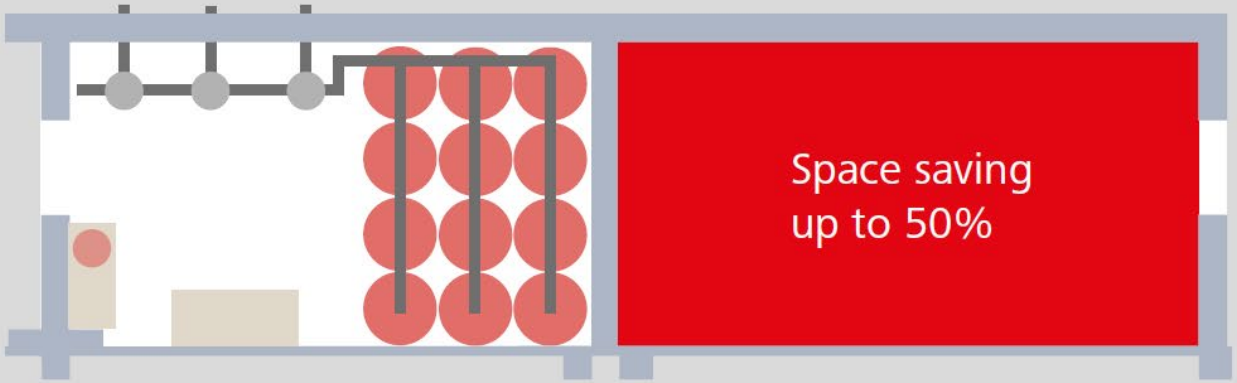
A

Space requirement with
80 l / 200 bar gas cylinders,
without Oxeo storage system



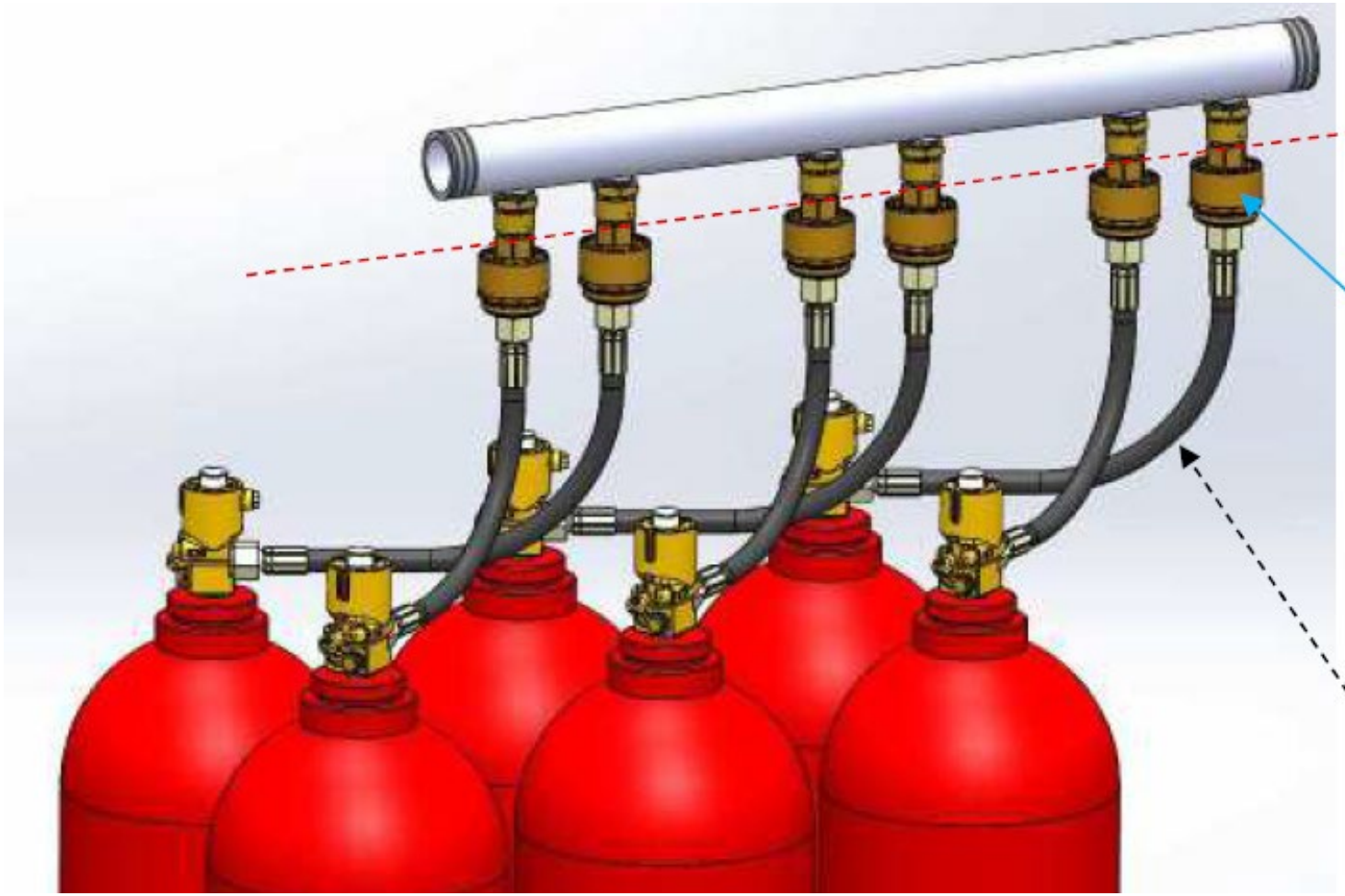
B

Space requirement with
140 l / 300 bar gas cylinders,
with Oxeo storage system



This illustration is an example

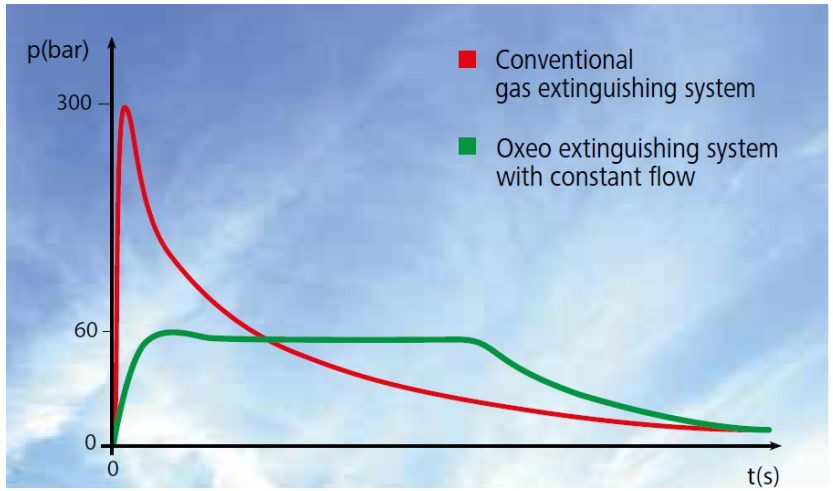
OXEO CF marine

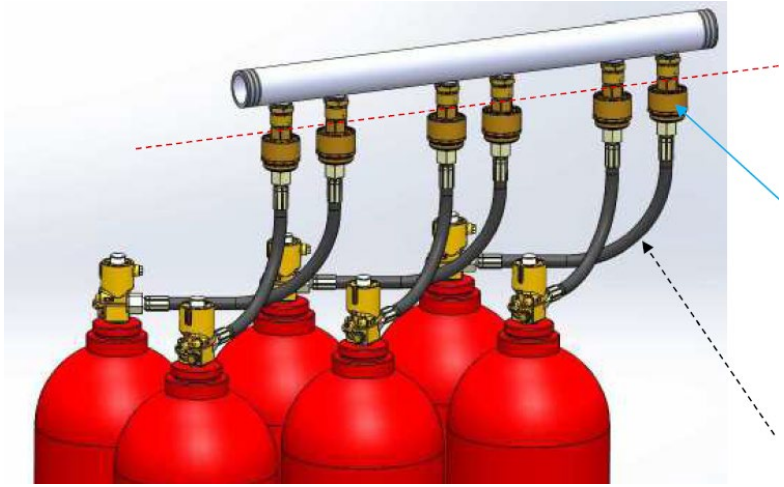


Checkvalve – High-/Low-pressure divide

Pressure regulating valve
CF-S-HP (high performance)

High pressure hose

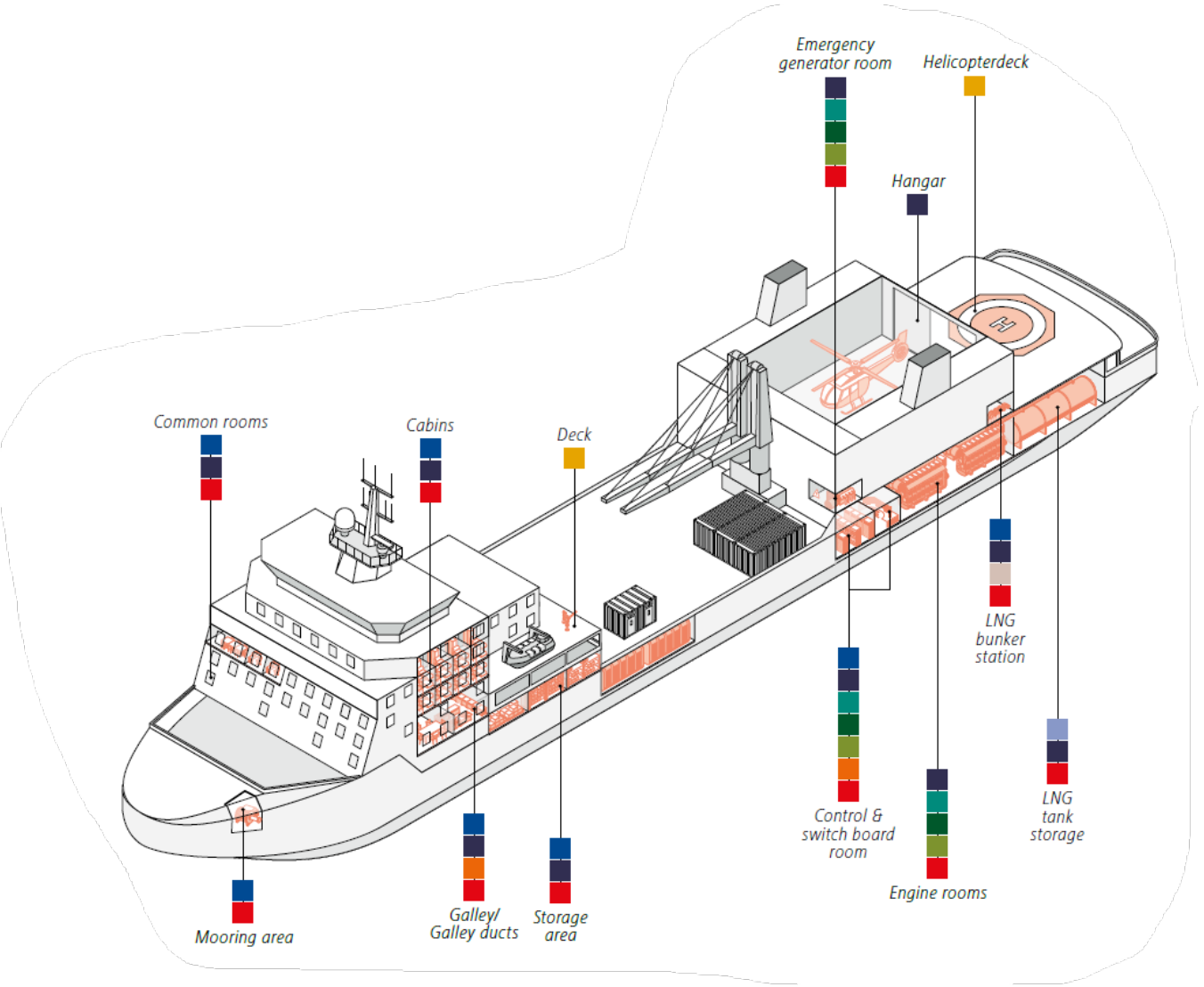




OXEO Constant Flow marine System

- **Benifits to Pipework**
  - PN63 instead of PN320
  - Optimized Diameters

- **Protected Space**
  - Pressure releave flaps



- Oxeo CF marine systems
- CO_2 extinguishing systems
- MX 1230 Marine clean agent fire suppression systems (FK 5-1-12)
- Powder extinguishing systems

- Sprinkler systems
- Deluge systems
- Minifog marine water mist extinguishing systems

- Fire detection systems
- Compact suppression systems
- Deck foam systems

Q & A