Comparison of Gaseous Extinguishants

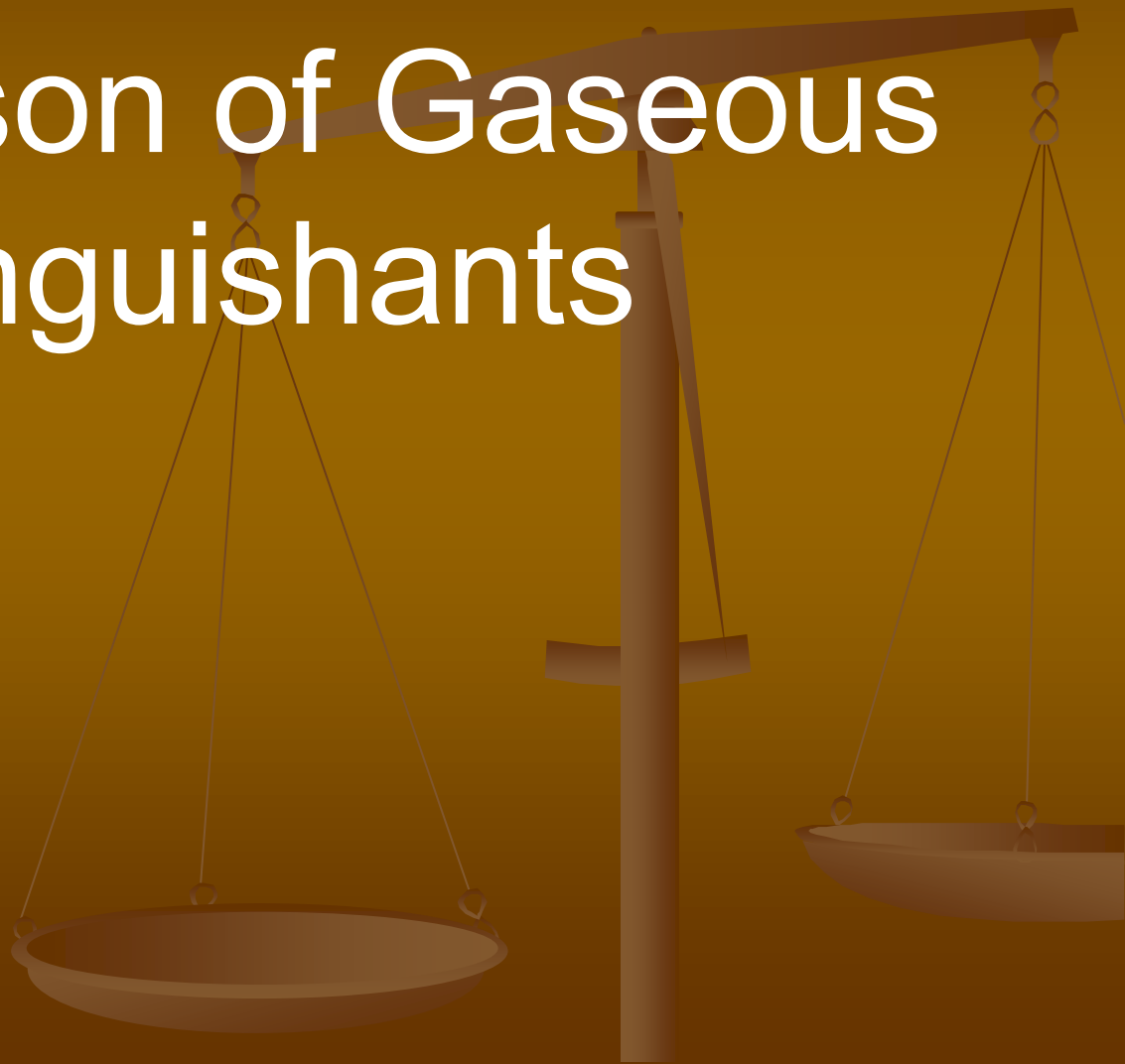


Table 2 : COMPARISON OF MATERIALS SAFETY DATA SHEETS

Item	Alternatives	AF11E	Argonite	CO_2	FE 13	Fs 49	Fm200	Inergen	NAF SIII	Pyrogen	H_2O Mist	NN100
A	**Health Hazard Data**											
1	Hazard to human health		Low	High	Low	Little	Low	Slight	Low	Low	Nil	Low
2	Hazard to environment		No	No	GWS	Little	GWS	No			Nil	No
3	Releases dangerous products when decomposed		No	No	Yes	Yes	Yes	No	Yes		-	No
4	Dangerous by products (hydrogen halides) in fire which can cause lung damage		No	No	Yes	Yes	Yes	No	Yes			Oxides of Nitrogen
5	High concentration can cause suffocation without forewarning				Fatal	Yes		No				-
6	High concentration can cause asphyxiation		May		Yes	Yes		Yes				Yes
7	Low concentration may cause frost bit		No		Yes	Yes		No				May
8	Gas is i. Colourless ii. Odourless iii. Havier than air		Yes Yes Yes	Yes Yes No	Yes No Yes	Yes No Yes		Yes Yes No				Yes Yes No
B	**Exposure controls**											
1	Require breathing protection		Yes	Yes	Yes	Yes		No				Yes
2	Safety glasses		No		Yes	Yes		Yes				Yes
3	Protective gloves		No	Yes	Yes	Yes		Yes				Yes
4	Neoprene apron and boots		No			Yes		No				No
5	Shower and eye wash station		No		Yes	Yes		No				Yes
C	**Other Considerations**											
1	Disposal - to recycle		No	No		Yes		No				No
2	Pressurised Sysstem		Yes	Yes	Yes	Yes	Yes	Yes		No		Yes

Table 3: **EXTINGUISHING TIME** (Base on LPC Reports)

AGENTS	Type of Test (time in sec.)					
	445mm n-heptene	300mm n-heptene	Large wood crib	Small wood crib	6mm PVC crib	PVC ribbon crib
AF11E	75.0	75.0	285.0	195.0	100.0	45.0
Argotec	73.0	87.0	54.0	58.5	16.0	5.0
Argonite	99.0	162.0	27.0	41.0	60.0	18.0
CO_2						
CEA-410	10.0	8.0	11.0	8.0	6.0	3.0
FE-13	5.0	3.0	4.5	4.0	4.0	1.0
FS49C2						
FM 200 (7%)	155.0	282.0, 320.0, 15.0	33.0	10.0	70.0	2.0
FM 200 (8.6%)	7.0	7.0	8.0	6.0	4.0	3.0
Inergen	62.0	116.0	31.0	39.0	39.0	6.0
NAFS111	11.0	8.0	6.0	8.0	100.0	2.0
Pyrogen						
Water Mist						
NN100						
HALON 1301	9.0	8.0	5.0	8.0	9.0	3.0

Class Of Fire	Description	Testing Materials
Class A	Fires involving combustible solid materials like paper, wood, etc.	Wood crib, PVC crib & PVC ribbon crib
Class B	Fires involving inflammable liquids like kerosene, diesel, etc.	N-Heptene
Class C	Fires involving flammable gases	
Class D	Fires involving reactive metals like sodium and potasium	
Class E	Fires involving ignition of an electrical nature	

Figure 2

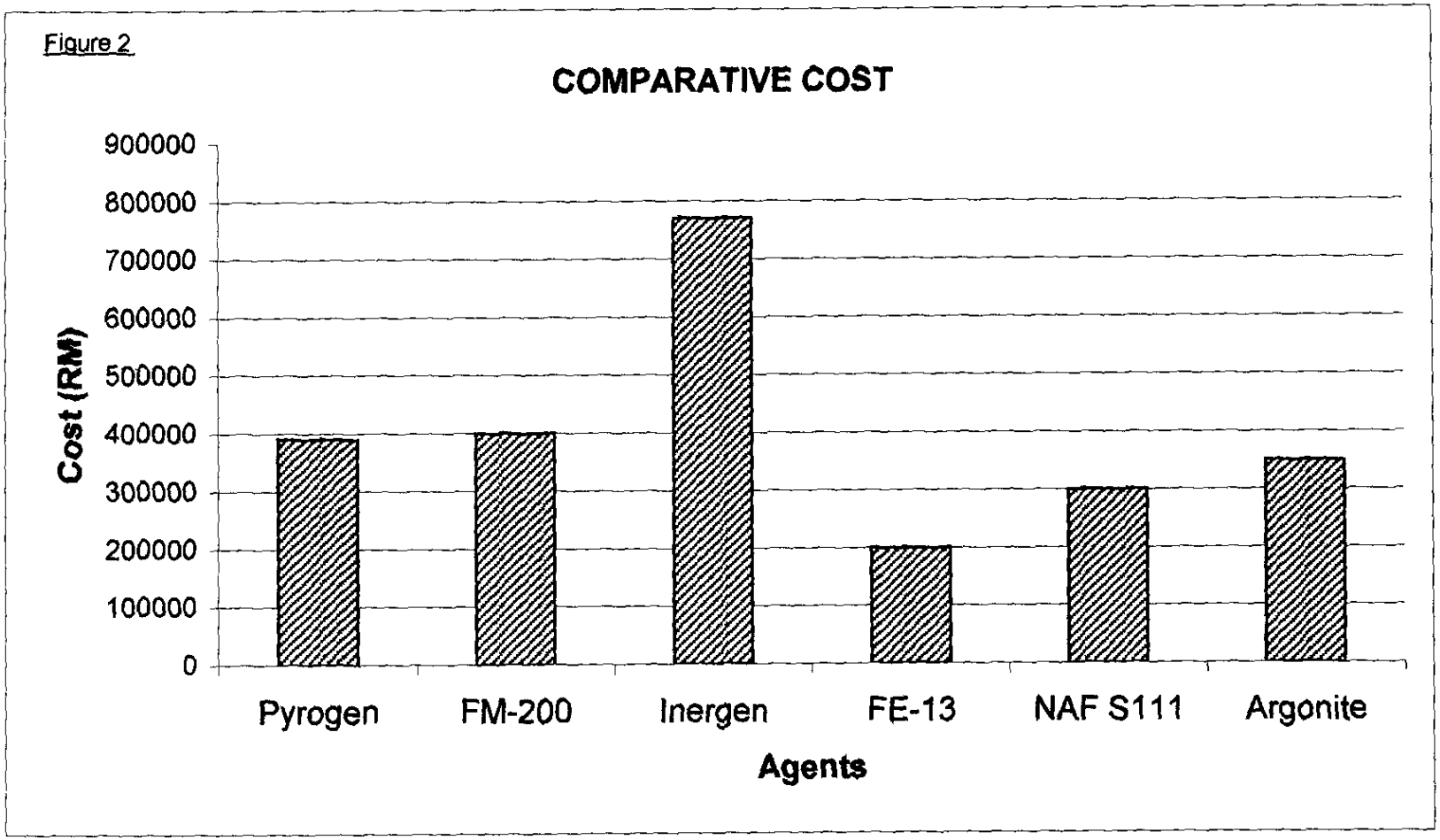

COMPARATIVE COST
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
Cost (RM)
Pyrogen
FM-200
Inergen
FE-13
NAF S111
Argonite
Agents

Fig: 3
Spatial requirement of Extinguishing Agent

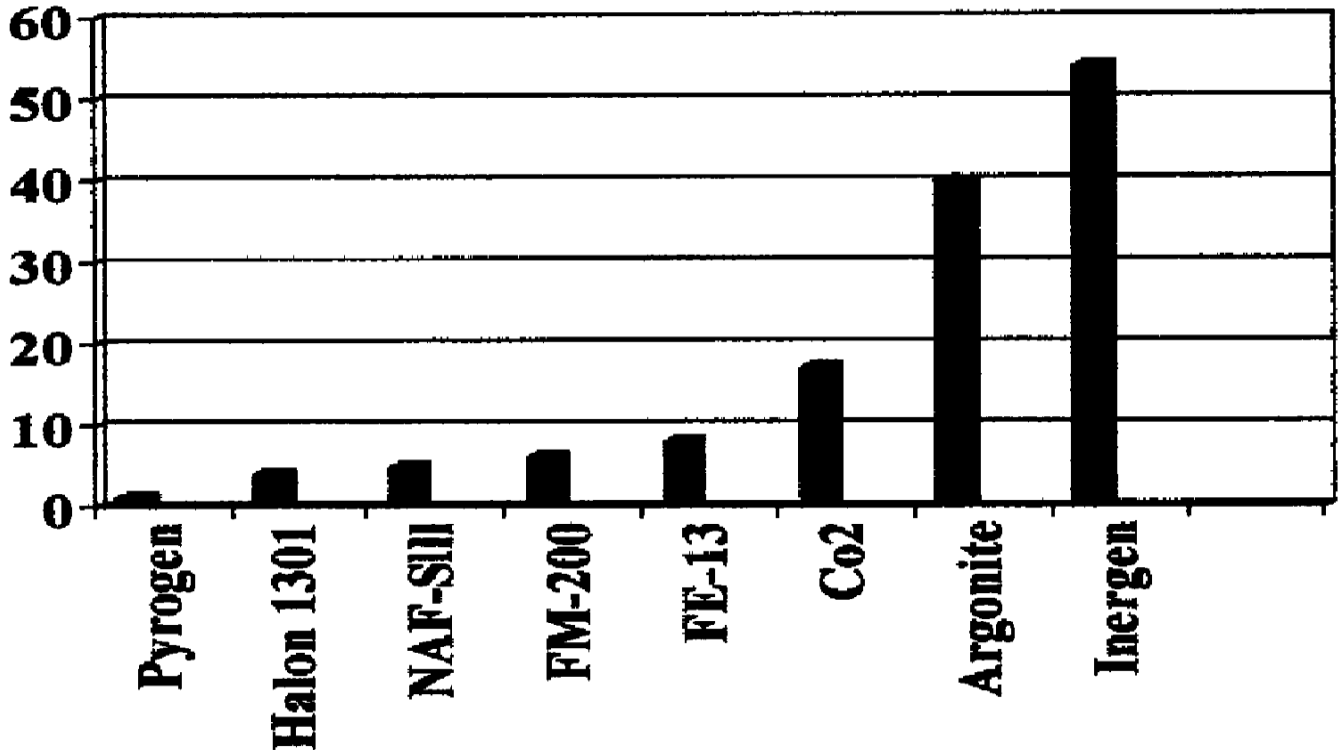


Table 1 : TABULATION OF ENVIRONMENTAL & RELATED PROPERTIES OF HALON ALTERNATIVES

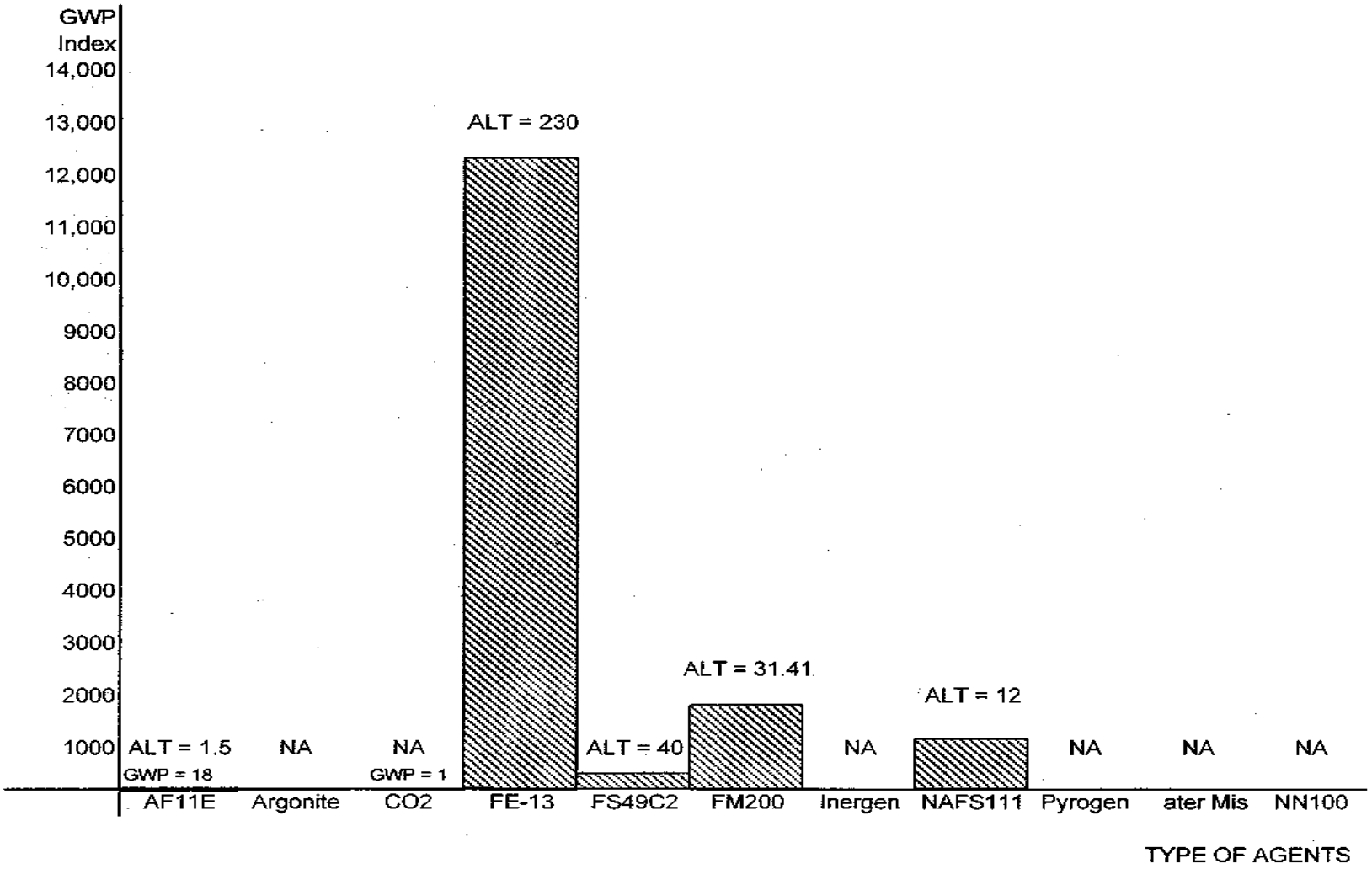
Item	Agent	Chemical Composition	tmosphere Life (yrs)	ODP	GWP	Cardiac Sensitisation		Min. Design Concent	Approving Std.	FRDM Approved usage	Others Approved usage	LC50 ppm	Storage vol. VS Halon	Phase out year
						NOAEL %	LOAEL %							
1	AF11E	HCFC-123 + OTH.	1.5	0.016	18	9.0	9.5	5	LPC	NNOA		>750,000	0.9	2030
2	Argonite	N2, Ar	0	0	0	43	52	39	NFPA 2001		OA-EPA		10	Non
3	CO_2	CO_2	NA	0	1.0					NNOA				Non
4	FE-13	HFC-23	230	0	12,100	50	>50	18	UL, FM, NFPA		OA-EPA	650,000	1.68	
5	FS49C2	HFC 349C2(R866), CO_2 + OTH.	40	0	350	13	15	8	IMO	NNOA		500,000	1.4	
6	FM 200	HFC-227EA	41	0	3300	9	10.5	7	BS5306, NFPA		OA-EPA	788,696	1.5	
7	Inergen	N_2, Ar, CO_2	NA	0	0	43	52	37.5	UL, FM, NFPA	OA	OA-EPA	Nil	10.5	Non
8	AFS111	HCFC Blend A	12	0.036	1450	12	14	9.9	UL, Canada, NFPA 2001		OA-EPA	320,000	1.1	2040
9	Pyrogen	KNO_3, $C_6H_3O_2$, C_3, H_5 + OTH.	0	0	0	Unknown	Unknown	$\frac{100gm}{m^3}$ *	USEPA	NNOA	NNOA-EPA	Unknown	0.33	Non
10	Water Mist	H_2O	NA	0	0	NA	NA	NA	NFPA, IMO	OA	OA-EPA	NA		Non
11	NN100	N2	NA	0	0	43	52	40.3	USEPA				10	Non
12	HALON	$CBrF_3$	65	16	5600	5	7.5	5	Prohibited	To Phase Out		800000	1	2005

Legend :
ODP = Ozone Depletion Potential
GWP = Global Warming Potential
NOAEL = No Observed Adverse Effect Level
LOAEL = Lowest Observed Adverse Effect Level
OA = Occupied Areas
UA = Unoccupied Areas
NNOA = Not Normally Occupied Areas
* = Measured by Weight per Volume

Table 4: **OBSCURATION & HAZARD OF THERMAL DECOMPOSITION** (Base on LPC Reports)

AGENTS	Obscuration during discharge	Thermal Decomposition, levels of Hydrogen Flouride from independent test
AF11E		
Argotec		
Argonite		
CO_2		
CEA-410	Moderate (50%+ for 2 minutes)	High, 92 to 1,556 ppm HF likely to exceed safe levels
FE-13	Moderate (50%+ for 30 seconds)	Severe, 21 to 1,029 ppm HF likely to exceed safe levels
FS49C2		
FM 200 (7%)	Severe (100% for 4 minutes or longer)	Severe, 220 to 10,234 ppm HF likely to exceed safe levels
FM 200 (8.6%)		
Inergen	None	None
NAFS111	Severe (100% for 4 minutes or longer)	Severe, 46 to 2,927 ppm HF likely to exceed safe levels
Pyrogen		
Water Mist		
NN100		
HALON 1301	Mild (20% for 4 minutes or longer	Moderate, 11 to 270 ppm HF possible to exceed safe levels

Figure 1 : **GLOBAL WARMING POTENTIAL COMPARE TO C02**



NOTE : NA = ALT Not Applicable