





COMPARATIVE FIRE AND EXPLOSION HAZARDS OF DOMESTIC FUELS

by

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SUMMARY

The frequencies of fires and explosions involving town gas, liquefied petroleum gas and burning oil are related to the domestic consumption over a ten year period.

The fire frequencies for equivalent quantities of fuel (in terms of heat output) are approximately in the ratio 10 : 5 : 1 for l.p.g., burning oil, town gas.

The explosion frequencies are approximately in the ratio 34 : 2.5 : 1 for l.p.g., town gas, burning oil.

KEY WORDS : Fuels; domestic; fire hazard; explosion; statistics.

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INTRODUCTION

To appraise a situation that is changing because of advertising, new methods of heating and cooking, and the increasing use of caravans, boats and modern camping equipment, a study has been made of the numbers of fires and explosions involving town gas, liquefied petroleum gas and burning oil. The results have been related to the domestic consumption of the three fuels during the ten years 1960 - 1969, and for purposes of comparison all the annual fuel consumption figures have been converted to "therms".

The production of fuels for domestic use increased steadily during the ten years $1960 - 1969^{1}$. The average annual production figures in the period were approximately 1950 million therms of town gas, 29 million therms of l.p.g. and 647 million therms of burning oil.

FIRE FREQUENCY

The estimated numbers of fires are shown in Table 1 and Fig. 1 and are based on an analysis of samples of fires reported by fire brigades in the United Kingdom, in which the material first ignited was one of the three named fuels, and which occurred in dwellings, caravans, ships or rivercraft².

Averages of 56.0 fires per 10⁸ therms of town gas, 583.7 per 10⁸ therms of liquefied petroleum gas, and 274.0 per 10⁸ therms of burning oil indicate that, for an equivalent quantity of energy, fires involving liquefied petroleum gas were approximately ten times more frequent than those involving town gas, and twice as frequent as those involving burning oil.

The rates of incidence of fires decreased with oil and gas, but increased with l.p.g. during the period considered.

EXPLOSION FREQUENCY

The numbers of explosions are shown in Table 2 and are based on a study of samples of fire reports which recorded explosions of one of the three fuels in dwellings, caravans, ships or rivercraft. All explosions are included whether they caused a fire or resulted from a fire, and whether the fuel was in use or being stored.

Averages of 64.9 explosions of liquefied petroleum gas per 10^8 therms, 4.8 explosions of town gas per 10^8 therms and 71.9 explosions of burning oil per 10^8 therms, indicate that, over the ten year period, for equivalent quantities of energy, explosions were thirteen times more likely with liquefied petroleum gas, than they were with town gas and two and a half times more likely with town gas than with burning oil.

FATALITIES IN EXPLOSIONS

Total casualties in incidents reported where fuel explosions occurred are shown in Table 3. A total of 24 deaths occurred in the ten year period where town gas exploded, five deaths where liquefied petroleum exploded and one in an incident involving an explosion of burning oil. Suicide deaths by gassing with subsequent explosion have not been included. CONCLUSIONS

The frequency of fires in which burning oil is recorded as the material ignited first is greater than that with town gas which, in turn, exceeds that with liquefied petroleum gas. When the quantities used are taken in account, however, l.p.g. appears to be about ten times as dangerous as town gas and more than twice as dangerous as burning oil.

Explosions are more frequent with town gas than with either liquefied petroleum gas or burning oil, but here again, when the quantities used are taken account of, the danger with l.p.g. appears to be about thirteen times that with town gas and about 34 times that with burning oil.

REFERENCES

- 1. Ministry of Power Statistical Digest, 1965 and 1970. H.M. Stationery Office, London.
- United Kingdom Fire Statistics, 1960 1969. H.M. Stationery Office, London.

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Table 1.

Fires in all dwellings, caravans, ships and rivercraft, where material first ignited was "town gas", liquefied petroleum gas or burning oil

	Town gas			Liquefied petroleum gas			Burning oil		
Year	No. of fires	Gas sold million therms	Fires per 10 ⁸ therms	No. of fires	Gas sold million therms	Fires per 10 ⁸ therms	No. of fires	Oil sold million therms	Fires per 10 ⁸ therms
1960	948	1298	73.0	136	26	523.0	1680	539	311.7
1961	866	1300	66.6	130	2'7	481.5	1564	509	307.3
1962	946	1 401	67.5	132	26	507.7	1912	596	320.8
1963	954	1540	61.9	138	26	530.7	24 <u>5</u> 8	695	353.7
1964	1022	16 1 4	63.3	154	28	550.0	1524	599	254.4
1965	936	1869	50.0	159	29	548.3	1579	639	247.1
1966	1009	2177	46.3	163	29	562.0	1637	645	253.8
1967	1083	2472	43.8	187	31	603.2	1669	673	248.0
1968	. 1268	2801	45•3	252	32	787.5	1860	745	249.6
1969	1246	3027	41•2	[.] 238	32	. 743.7	<u>,</u> 1604	825	1.94 •4
	Total 10278	Av. 1949.9	Av. 56.0	Total 1689	Av. 28.6	Av. 583.7	Total.17487	Av. 646.5	Av. 274.0

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Explosions and fuel distribution in all dwellings, ships and rivercraft **.** . .

	Town gas			Liquefied petroleum gas			Burning oil		
Year	No. of explosions	Gas sold million therms	Explosions per 10 ⁸ therms	No. of explosions	Gas sold million therms	Explosions per 10 ⁸ therms	No. of explosions	Oil sold million therms	Explosions per 10 ⁸ therms
1960	76	1298	5•9	25	26	96.2	4	539	0.74
1961	46	1300	3.5	20	27	74.1	20	509	3.9
1962	. 64	1 401	4.5	18	26	69.2	22	596	3.7
1963	84	1540	5.4	6	26	23.1	6	695	0.86
1964	80	1614	5.0	8	28	28.6	8	599	1.3
1965	78	1869	4.2	. 10	29	34.5	8	639	1.2
1966	97	2177	4.5	13	29	44.8	12	645	19
1 9 67	107	2472	43	32	31	103.2	19	673	2.8
1 96 8	166	280 1	5.9	32	32	100.0	12	7 45	1.6
1969	155	3027	5.1	24	32	75.0	16	825	1.9
	Total 953	∆v. 1949.9	Av.4.8	Total 188	Av. 28.6	Av. 64.9	Total 127	Av. 646.5	Av. 1.9

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Table 3

	Fatal casualties in explosions							
Year	Number	Fuel involved						
	of deaths	Gas	L.P.G.	0i1				
1960	Nil	l	-	-				
1961	Nil	`-	-	-				
1962	3	2	-	1				
1963	Nil		_	-				
1964	3	2	1	_				
1965	4	4	-	-				
1966	6	6	_	-				
1967	1	1	-	-				
1968	7	7	-	-				
1969	6	2	4	_				
Total	30	24	5	1				

Explosion fatalities

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FIG.1 RATES OF INCIDENCE IN TERMS OF ENERGY OUTPUT

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