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FIRES IN OIL REFINERIES AND OUTDOOR
CHEMICAL PLANT IN 1969

by

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SUMMARY

It is estimated that fire brigades attended 242 fires in oil refineries and chemical plants in 1969, of which 52 were in oil refineries. The corresponding total figures for these two hazards for 1967 and 1968 were 171 and 204 respectively, representing an increase of over 40 per cent from 1967 to 1969.

The major causes were spontaneous combustion, fixed equipment or machinery, steam or hot pipes, welding equipment and kilns or furnaces, together accounting for over 75 per cent of the fires.

About half the fires in 1969 were successfully tackled before the arrival of the brigade, but of the remainder, over 80 per cent required the use of jets for hose reels.

KEY WORDS: Fire statistics, Chemical, Oil, Industry, Extinguishing
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Introduction

This note is intended to provide statistical information on fires attended by fire brigades in oil refineries and outdoor chemical plant. It is generally acknowledged that fires in these establishments can become serious because of the flammable liquids involved and it is essential for them to be detected easily and dealt with promptly. Most oil refineries and outdoor chemical plants have their own works fire brigades and standard emergency procedures laid down in consultation with their local authority brigades. This note deals with those incidents which were attended by local authority brigades, and not those which were extinguished by works fire brigades without calling the local authority brigade.

Frequencies and Sources of Ignition

It is estimated that there were 242 fires in oil refineries and chemical plants in the United Kingdom in 1969 of which 52 were in refineries and 190 in outdoor chemical plant. The corresponding figures for the two categories combined in 1967 and 1968 (when the classification used did not allow for separation) were 171¹ and 204² respectively, so that there is evidence of a substantial upward trend in these fires. The sources of ignition of the 1969 fires are shown in Table 1.

Table 1

Sources of ignition of fires in oil refineries
and chemical plant, United Kingdom 1969

(Frequencies observed in a 1-in-2 sample of reports X 2)

Source of ignition	TOTAL	Oil Refinery	Chemical plant
TOTAL	242	52	190
Spontaneous combustion	56	12	44
Fixed equipment or machinery (not elsewhere specified)	42	6	36
Steam pipes, hot pipes	34	6	28
Welding or cutting equipment	34	10	24
Kiln, furnace (all fuels)	20	8	12
Hot metal	8	-	8
Boiler (not tar)	8	-	8
Wire and cable, electrical supply apparatus	6	2	4
Natural occurrences (e.g. lightning)	4	-	4
Other known causes	20	6	14
Unknown	10	2	8

Method of extinction and size of fires

It is difficult to obtain an accurate measure of spread and only one fire in the sample was known to spread to buildings. It is known that there were four fires³ in outdoor chemical plant in 1969 in which an estimated direct loss of over £10 000 was recorded. There was none in oil refineries. (For comparison, the corresponding figure for "chemicals and allied industries - fires in buildings" was 41). Some indication of the size of a fire is given by the method of extinction used and details of this are shown in Table 2.

The use of specialist fire fighting equipment (e.g. foam) is shown in Table 3.

Table 2

Methods of extinction of fires in oil refineries
and chemical plant, United Kingdom 1969

(Frequencies observed in a 1-in-2 sample of reports X 2)

Method of extinction	TOTAL	Oil refinery	Chemical plant
TOTAL	242	52	190
Extinguished before arrival of fire brigade	128	22	106
Fixed installations	32	4	28
Small non-chemical means (eg beating, smothering, buckets)	14	2	12
Extinguishers	36	12	24
Garden hose	2	-	2
Hose reel jet (tank supply only)	18	2	16
Inside hose/reels/hydrants	4	-	4
Jets from pumps and hydrants	22	2	20
Extinguished by fire brigade	114	30	84
Fixed installations	2	-	2
Small non-chemical means	6	-	6
Extinguishers	2	-	2
Hose reel jets	32*	4	28*
Inside hose reels/hydrants	10	2	8
Jets from pumps and hydrants	62	24	38

* In two instances more water than that in tank was used.

Table 3

Use of specialist fire fighting equipment

(Frequencies observed in a 1-in-2 sample of reports X 2)

Equipment	TOTAL	Oil refinery	Chemical plant
TOTAL	46	20	26
Breathing apparatus	8	2	6
Foam	30	14	16
Breathing apparatus and foam	4	-	4
Other	4	4	-

Table 2 shows that 22 of the 52 fires in oil refineries (42 per cent) were extinguished without brigade assistance. Four-fifths of the remainder needed the use of jets and in 6 cases, 3 or more jets were required.

In chemical plants, 106 (56 per cent) of the fires were successfully put out before the arrival of the brigade. Thirty-six of these needed the use of works fire brigade jets or hose reels. Of the 84 incidents which were extinguished by the local authority fire brigade, 66, nearly four-fifths, required the use of hose reel jets or jets from power pumps.

Table 3 shows that in 20 of the 52 fires in oil refineries specialist equipment was used, e.g. foam. There were no reports of the use of high-expansion foam in the 1-in-2 sample of reports.

The demand for specialist equipment was less in chemical plants in that it was needed in only 26 of the 190 incidents. As with oil refineries, no reports of the use of high-expansion foam were observed.

Discussion and conclusions

The hazardous nature of oil refineries and chemical plant justifies a high level of fire precautions and provision of on-site fire fighting equipment. The frequencies of fires attended by fire brigades are low, but they increased from 171 in 1967 to an estimated 242 in 1969, a rise of 41 per cent in the three year period.

The major causes of fires in oil refineries and chemical plants are spontaneous combustion, fixed equipment or machinery, steam pipes or hot pipes, welding or cutting equipment and kilns or furnaces which together account for about three quarters of the fires.

There were four fires in outdoor chemical plant in 1969 in which the estimated direct loss was over £10 000, but no such losses were reported in oil refineries.

Forty per cent of the fires in oil refineries and over 50 per cent of those in chemical plants are tackled before the arrival of the fire brigade, but most of the remaining incidents are sufficiently large to warrant the use of hose reel jets or jets from pumps and hydrants. The use of specialist equipment, such as breathing apparatus or foam, is reported in 38 per cent of the oil refinery fires and in 14 per cent of the fires in chemical plant.

References

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