

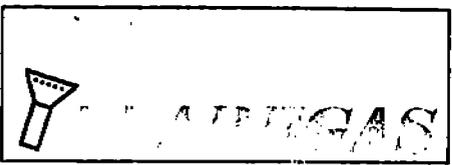
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FLARE

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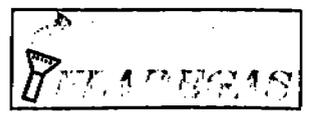


Offices in: New York, Paris, Dusseldorf, Milan, The Hague. Agents in: Australia, South Africa, Spain, Japan

FLAREGAS CORPORATION

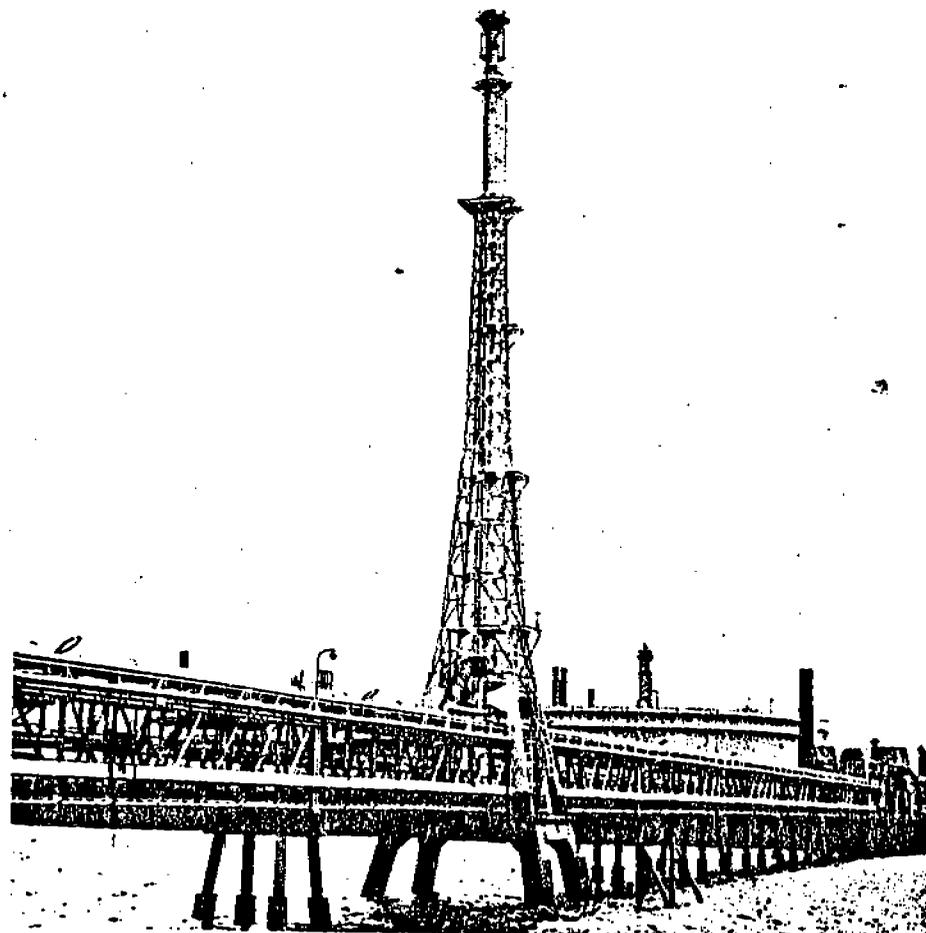
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The calculations to determine the height of a flarestack in a flare system must take into consideration the aspect of pollution by toxic or noxious materials from the flare effluents, in addition to the heat radiation effects.

There is much published literature surrounding these basic points, but it is often swamped by mathematical hypotheses or formulae unsupported by practical experience.

Simple graphical solutions are usually appreciated by engineers hard pressed for time and we have reproduced in this article some suitable figures aimed at the establishment of working relationships and the saving of time.

The fundamental laws concerning the behaviour of gases discharging into the atmosphere concern the buoyancy of the gases and their velocity of discharge under ideal conditions and their subsequent dispersion in the surrounding atmosphere.

For practical applications there are various modifications in formulae which take into consideration wind effects, changes in climatic conditions and the influence of topographical features.

For the flaring of toxic material a somewhat different approach to the calculation of stack height has to be taken from that which considers heat radiation. For, although the material may be completely combustible to harmless products, allowances must be made for possible incomplete combustion in the flare flame. It must be assumed that up to 5 per cent gases combust when the gas at the end of the flame is assumed to burn, and this amount of gas must be sufficiently diluted by the air such that the maximum concentration at ground level never exceeds the acceptable limits. Hydrogen cyanide, for example, is commonly met in acrylonitrile processes. The ground level concentration of this lethal gas should never be greater than 1.0 part per million. To ensure that this requirement is met, it is necessary to consider the height to which the hot gases from the flame must reach to allow for the dispersion of the hydrogen cyanide in the atmosphere due to the normal processes of diffusion and turbulent mixing.

Within the considerable volume of literature available to determine plume rise and dispersion of furnace gases emitted by chimneys, there has been little done to investigate these processes when applied to flarestacks. It has been suggested by a number of authorities that the same rules can be applied by considering the emission as furnace gases containing the same amount of heat derived from combustion. As the combustion is not instantaneous but proceeds along the whole length of the flame, the concept of a buoyant column of furnace gases penetrating directly upward into the atmosphere should strictly be modified to that of a plume extending some 120 diameters from the flare tip (Page 5). How much this actual mechanism of delayed combustion differs from the theoretical instantaneous combustion can only be established by sampling tests, infra red photography or similar techniques.

Occasionally multiple stack installations are planned which may all be flaring simultaneously. It has been shown by various authorities that for adjacent stacks in neutral conditions no enhancement of individual plume rises may be claimed and the total final down wind effect must be the arithmetic sum of g.l.c. from each polluting stack. It is reasonable to assume, however, that when two flare stacks are sufficiently close together for the flames to coalesce then the plume rise may be calculated from the combined heat release of the resultant flame.

It is very rare that the full flaring rate consists of toxic material only and this is frequently based upon the unlikely event of a fire beneath a storage vessel containing the material. Generally the toxic substances consist of relatively low proportions with hydrocarbon forming the main bulk of the discharge. The analysis by the process engineer is critical in setting the correct parameters for the g.l.c. calculation, Where toxic materials go to flare it is not always sufficient to quote only the maximum throughputs of all materials as required for basic sizing of the flare, but also that condition should be isolated which causes the greatest concentration of toxic materials with the least heat release case. Examination of a few cases will soon show which one governs to produce the greatest g.l.c.

These flaring situations are usually brought about by overpressure on process vessels initiated by electrical or cooling water failure. It often happens that the hydrocarbon content requires a tall stack to satisfy the heat intensity considerations and the g.l.c. requirements can be met at the same time.

In calculating the stack height for the flaring of non toxic gases the major consideration is the welfare of personnel likely to be exposed to high levels of heat radiation. There can also be risk of damage to equipment although equipment can usually tolerate much higher levels.

The intensity of heat radiation of any distance from the flare is calculated by the inverse square law assuming equal radiation in a sphere from the flame.

$$I \text{ (intensity)} = \frac{Q \text{ (heat release)} \times E \text{ (emissivity)}}{4 \pi R^2}$$

Where R is the distance from the apparent centre of the heat source (flame) to the position of the observer.

The heat release Q is readily calculable, or for most hydrocarbons may be estimated by taking a calorific value of 20,000 Btu/lb or 11,000 Kcal/kg.

The emissivity E is the fraction of total heat appearing as radiation. Whilst the theoretical figures for radiated heat may be quite high, 35% in some cases, practical values determined in the field are generally much lower. These lower values can be attributed to a number of factors viz:—

- i The degree of combustion, which is incomplete in a raw gas flame.
- ii The presence of free carbon, which may increase the luminosity and emissivity or more significantly may produce black smoke which blocks radiation from the flame. Furthermore, each pound of free carbon uncombusted represents a reduction of 14,100 Btu from the total heat Q.
- iii Apparent emissivity decreases with distance since some of the radiated heat is absorbed both by the combusted gases leaving the flame and by the air layers between the flame and the point of measurement.
- iv With smokeless tips the injection of steam appears to reduce the emissivity greatly. This is illustrated in Fig. 5 It can be seen that the value of E decreases as the steam/hydrocarbon ratio increases. The actual base ratio of steam to hydrocarbon for smokeless flaring depends upon gas composition.

Fig 5

Emissivity Test — Prototype FS-24 (ICI Wilton)				
Run No.	Propylene lb/hr.	Steam lb/hr.	STM/HCM	Average E
1	45,600	17,900	0.39	0.10
2	36,200	16,700	0.46	0.078
3	25,500	12,500	0.49	0.074
4	16,800	7,150	0.42	0.106
5	10,300	3,270	0.32	0.115
6	10,300	—	—	0.135
7	10,300	15,000	1.45	0.067

Note:
E. decreases as steam/hydro-carbon ratio increases. In run 7 the flame almost transparent, characteristic of fully inspirated flames where the emissivities of CO₂ and H₂O are the only contributors to total emissivity.

There is an obvious relationship between practical values of E and the method used for their determination and so the results quoted or relied upon in the figures have been determined using equations and relationship shown elsewhere in this article.

Fig. 5 case 6 without steam is the most important since this approaches the condition of flame at maximum load and the apparent emissivity is typical of other field data in that it does not exceed 15% of the total heat release.

To calculate R in the foregoing equation it is necessary to determine the position of the apparent point source of heat. The method used and demonstrated in Fig. 6;7 relies upon an estimation of L the length of flame. This is determined basically as 120 times the top diameter D, a relationship which is borne out in test data on discharge of hydrocarbon vapours into air, in which it was found that 120 D represented the range at which the air/hydrocarbon mixture fell below the lower flammability limit and therefore could not burn.

The various relationships between QRL & D can be roughly charted (Figs. 6 & 7) to provide a quick guide in estimation of diameters and heights etc.

The bases of calculation are illustrated in the figures together with the allowance for flame lean due to wind. It must be remembered that these curves are of necessity only approximate and all based on the assumptions stated which create a mid range situation.

It should be noted that the stack height H is based upon the acceptable heat intensity of 1500 Btu/sq ft (or 4000 Kcal/sq m.h.) This intensity will only harm personnel if skin is exposed for more than a few seconds. Most refinery employees are fully clothed while going about their duties. Should they, however, be unfortunate enough to be in the vicinity during a major discharge they will, by reflex action, turn away and move safely in the opposite direction.

If sufficient waste ground area is available — i.e. in desert locations — advantage may be taken of using a very economical stack design known as a "mini-stack". This design produces 1500 Btu/sq ft. (h) at a radius designated 'sterilisation' SR (Mini) in Fig. 7

All the curves reproduced in this article are intended to assist engineers in rapid approximations of levels of pollution and acceptable flarestack heights. All problems of this nature must be treated on their individual merits and Flaregas Engineering Limited are always pleased to engineer Flare systems to meet stringent pollution requirements.

Figs. 1 and 2 are published curves produced basically for chimney calculations but which may be adapted for use with flares to provide an estimate of g.l.c.

g.l.c. → ground level conc.

Fig. 1 indicates the plume rise of the hot gas column for various stack gas temperatures. As for a given heat release the temperature of exhaust gases is closely related to the gas flow rate, it is possible to work back through assumed excess air figures and determine a theoretical gas rate and temperature for any heat release. By taking 100% excess air and allowing up to 35% heat losses by radiation we can arrive at a gas temperature of 1500° F. Since the plume rise is dependant on total heat rather than actual temperature and rate, the error involved in this calculation is small. This allows the construction of Fig. 3 which gives plume rise on this basis.

It should be noted here that Fig. 3 gives a conservative estimate of plume rise when compared with other authorities using a similar basis and consequently is reasonable. It should be noted also that the extrapolation up to 100,000 ft plume rise obviously does not take into consideration higher atmospheric condition changes.

Fig 1

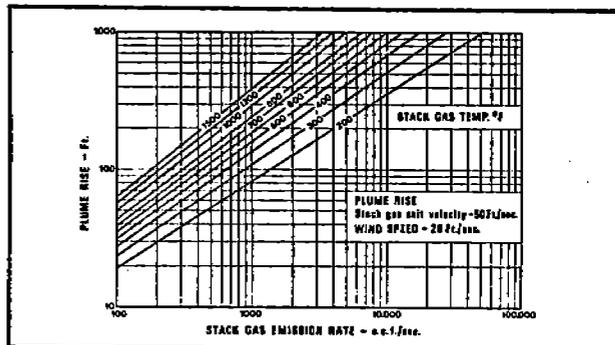
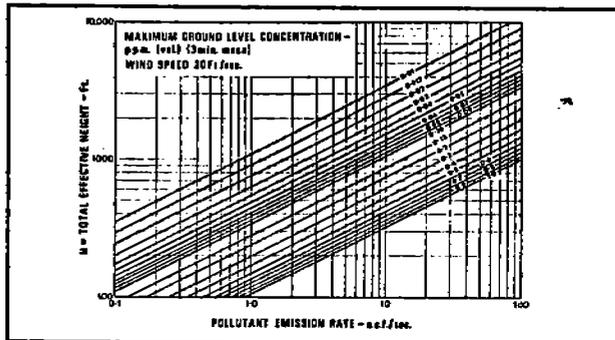


Fig 2

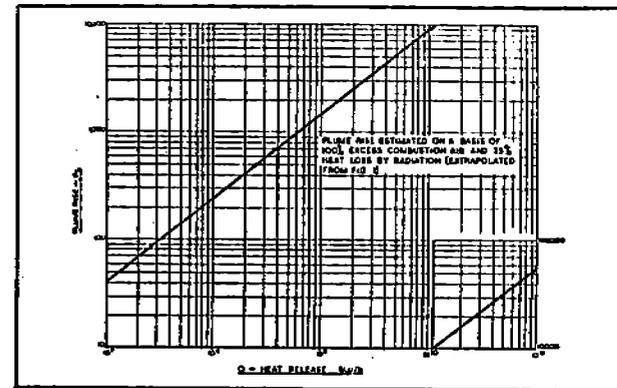


It would seem, therefore, that a reasonable estimate can be made of the effective height of plume rise and the subsequent dispersion of the pollutant calculated. The stack height from these calculations should provide a reasonable solution to the pollution problem since it should be remembered that the frequency of emission is usually vanishingly small compared with the constant effluent from a chimney.

Page 8 extracted from the API Manual for the disposal of Refinery Wastes lists the threshold limits for many of the toxic substances likely to be encountered in petrochemical works. The stack height is calculated on a g.l.c. around 10% of these values measured over a short interval. The 10% gives a reasonable margin in terms of threshold limits since these are based upon prolonged exposure, which is not generally obtained with flaring.

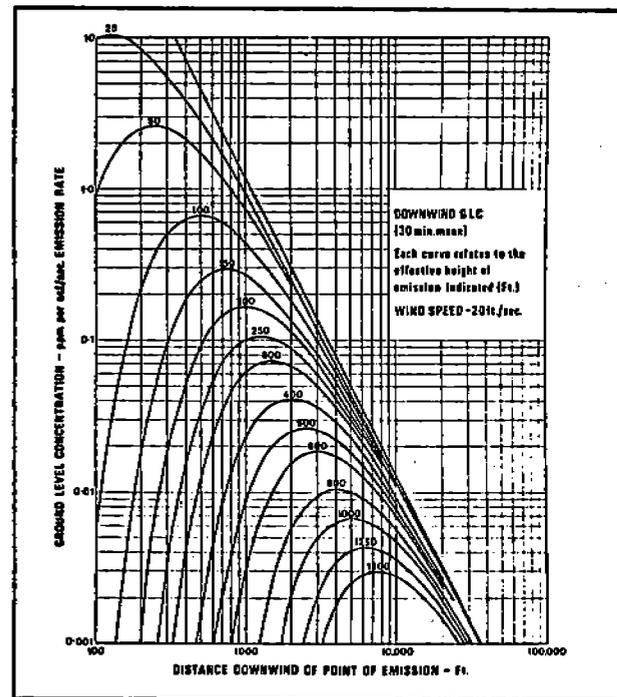
Figs 1, 2 and 4 by courtesy of P. Sutton, B.Sc. (Eng)

Fig 3



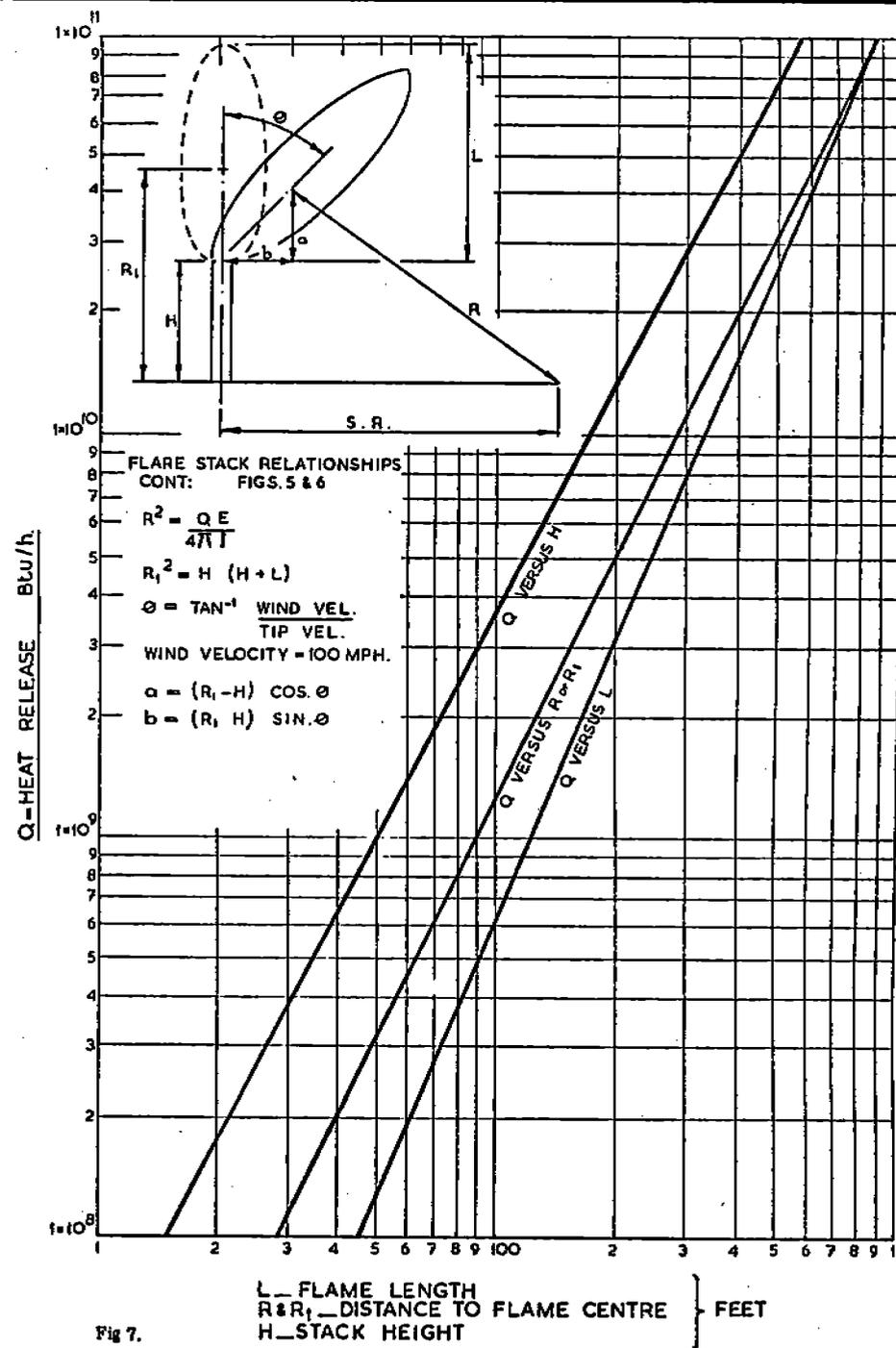
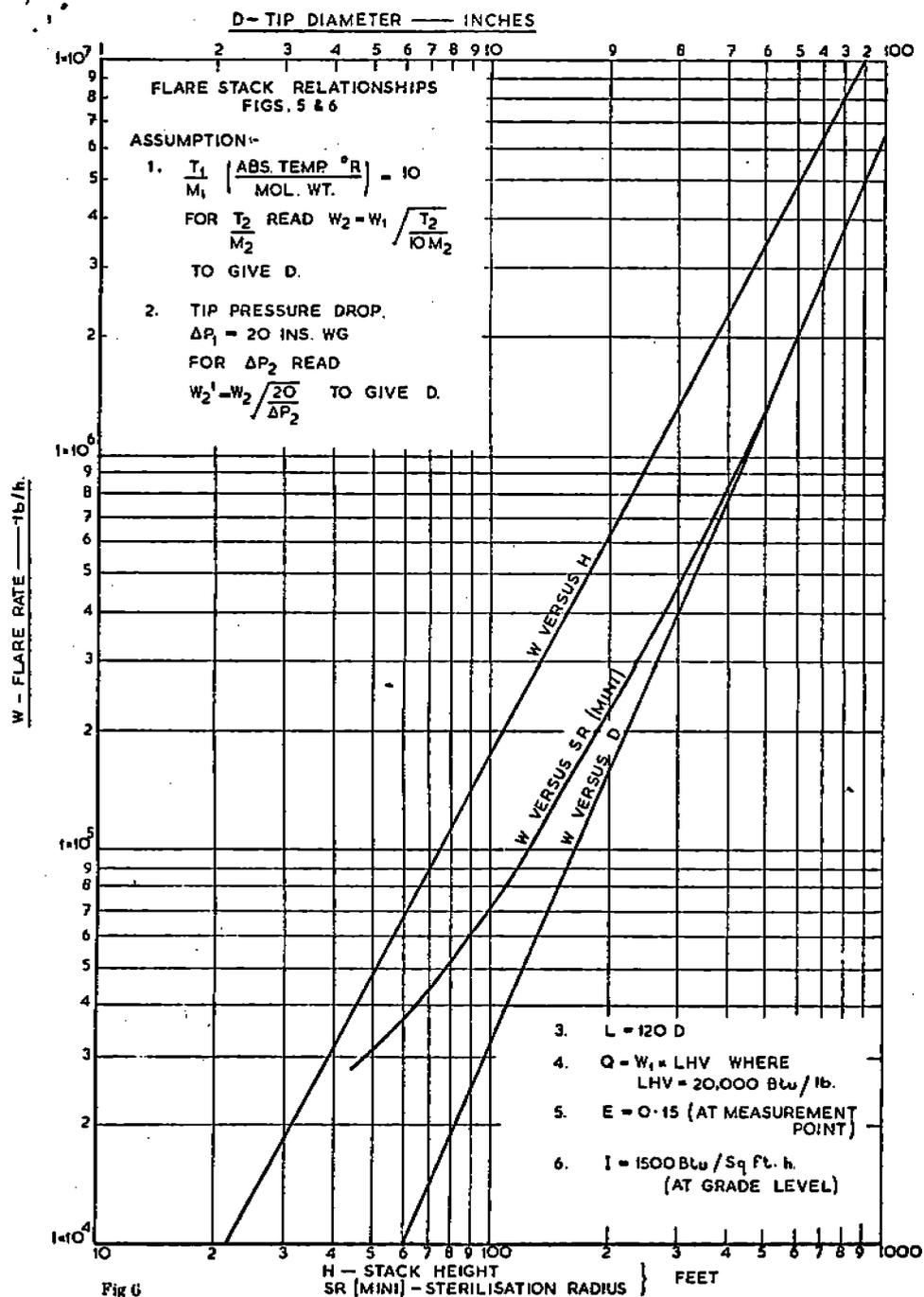
The time base used for the data given in the earlier curves is 3 minutes. This is because wind variations give wide fluctuations over a longer period and commercial analysts would not give representative results with a shorter period. In Britain the use of a 3 minute period is common, but it is important to remember when making calculations that in other parts of Europe and in North America 30 minutes is more normal. The time base must always be given with a g.l.c. calculation and published data has established an approximate relationship between 3 min. and 30 minute mean g.l.c. figures as 1.5 : 1.

Fig 4



The pollutants fall, obviously, on the down wind side of the stack. A typical down wind gradient of g.l.c. is illustrated in Fig. 4 based on frequently accepted formulae which locate the point of maximum g.l.c. at five times the total effective height of the plume. The wind speed involved in this calculation is 20 ft/s which is around the median figure in Britain and probably also around the figure which in fact produces the greatest actual ground level concentrations.

Note that the time base for this curve is 30 minute mean whereas earlier figures have a 3 minute basis, but this serves to illustrate the trend.



Gas or Vapour	PPM*	Gas or Vapour	PPM*
Acetaldehyde	.200	Hydrogen selenide	0.05
Acetic acid	.10	Hydrogen Sulfide	.20
Acetic anhydride	.5	Isodine	0.1
Acetone	1,000	Isophorone	.25
Acrolein	0.5	Isopropylamine	.5
Acrylonitrile	.20	Mesityl oxide	.50
Ammonia	.100	Methyl acetate	.200
Amyl acetate	.200	Methyl acetylene	1,000
Amyl alcohol	.100	Methyl alcohol	.200
Aniline	.5	Methyl bromide	.20
Arsine	0.05	2-Methoxyethanol	.25
Benzene	.35	Methyl chloride	.100
Benzyl chloride	.1	Methylcyclohexane	.500
Bromide	.1	Methylcyclohexanol	.100
Butadiene	1,000	Methylcyclohexanone	.100
Butyl alcohol	.100	Methyl formate	.100
Butylamine	.5	Methyl amyl alcohol	.25
Carbon Dioxide	5,000	Methylene chloride	
Carbon disulfide	.20	(dichloromethane)	.500
Carbon Monoxide	.100	Naptha (coal tar)	.200
Carbon tetrachloride	.25	Naptha (petroleum)	.500
Chlorine	.1	pNitroaniline	.1
Chlorobenzene	.75	Nickel carbonyl	0.001
Chloroform	.100	Nitrobenzene	.1
Cresol (all isomers)	.5	Nitroethane	.100
Cyclohexane	.400	Nitrogen dioxide	.5
Cyclohexanol	.100	Nitromethane	.100
Cyclohexanone	.100	Nitrotoluene	.5
Cyclohexene	.400	Octane	.500
Cyclopropane	.400	Ozone	0.1
Diacetone alcohol	.50	Pentane	1,000
0-Dichlorobenzene	.50	Propyl Ketone	.200
1, 1-Dichloroethane	.100	Phenol	.5
Diethylamine	.25	Phenylhydrazine	.5
Diisobutyl ketone	.50	Phosgene (carbonyl chloride)	.1
Dimethylaniline	.5	Phosphine	0.05
Dimethylsulfate	.1	Phosphorus trichloride	0.5
Diethylene Dioxide	.100	Propyl acetate	.200
Ethyl acetate	.400	Propyl alcohol	.400
Ethyl alcohol (ethanol)	1,000	Propyl ether	.500
Ethylamine	.25	Propylene dichloride	.75
Ethylbenzene	.200	Pyridine	.10
Ethyl bromide	.200	Quinone	0.1
Ethyl chloride	1,000	Stibine	0.1
Ethyl ether	.400	Styrene	.200
Ethylene chlorohydrin	.5	Sulphur dioxide	.10
Ethylenediamine	.10	Sulphur hexafluoride	1,000
Ethylene dibromide	.25	Sulphur monochloride	.1
Ethylene dichloride	.100	Sulphur pentafluoride	0.025
Ethylene oxide	.100	1,1,2,2-Tetrachloroethane	.5
Fluorine	0.1	Tetrametromethane	.1
Formaldehyde	.5	Toluene (toluol)	.200
Gasoline	.500	o-Toluidine	.5
Hydrazine	.1	Trichloroethylene	.200
Hydrogen bromide	.5	Trichloroethane	.500
Hydrogen chloride	.5	Turpentine	.100
Hydrogen cyanide	.10	Vinyl chloride	.500
Hydrogen fluoride	.3	Xylene (xylol)	.200
Hydrogen peroxide 90%	1		



From AUSTRALIA — Our Agents —

Uniquip Pty. Ltd., 83 Willoughby Road, Crows Nest, N.S.W. Australia 2065.

report that the FS-18 anti-pollutant Flare and the 4" Subsidiary Flare supplied to C.S.R. Chemicals Pty. Ltd. has been successfully commissioned and is performing to the complete satisfaction of the customer. Uniquip's marketing efforts will be strengthened by the anticipated Flaregas participation in the Sydney Environment '73 Anti-Pollution Exposition to be held in February 1973 where it is hoped that a full scale FS tip will be exhibited on the Flaregas stand.

From CANADA —

The latest contract awarded to Flaregas by Petrofina Canada, for an Anti-Pollutant flare system, is installed in their Pointe-Aux-Trembles complex.

Initial discussion with the main contractor, The Lummus Company of Canada, was followed by a visit to the Point Tupper Refinery of Gulf Oil of Canada Limited, to witness the performance under operational conditions. This anti-pollutant system, which has been since continuous service since its successful commissioning in 1971, was found to be performing a satisfactory task. Its response to change, in flaring conditions, was aptly demonstrated and readily observed by the visitors, and for the demonstration we are indebted to the Refinery personnel.

Further detailed technical discussions with Petrofina resulted in a final system of 42" dia. with an overall height of 210 feet.

The system has been designed for the following conditions:

Flow Rate (lb/hr)	Mol. Wt.	Units	Temp. °F
13,650	28.6	HDA	107
109,000	16.0	Isomax	250
20,000	44.0	H ₂	100
400,000	75	Fract. Unit	320
80,000	37	Platformer	355
126,100	65.6	Sulfotane	345

From India —

Following successful completion of the Flare System contract received through Technip on behalf of the Indian Oil Corporation for their Haldia refinery in India, Flaregas have been negotiating with the Fertilizer Corporation of India. These negotiations have resulted in an export contract placed directly by IFFCO for a complete flare system to be installed in their new ammonia plant at Kalol, India. The complete elevated flarestack will be fabricated in the UK and shipped in sections to site. Estimated completion for this contract is February 1973.

From the U.S.A.

At long last we are pleased to announce the formation of an American subsidiary:

"FLAREGAS CORPORATION"

with its Head Office at West Nyack. Management of the Flaregas day-to-day affairs is the concern of Raphael Ortiz, the General Manager, whilst its Presidency comes under the wing of Al J. Stella, Jr.

The main endeavour of this new company will be to further the interests of Flaregas in the field of anti-pollutant technology in North America. Their full name and address is as follows:

Flaregas Corporation, P.O. Box 237, West Nyack, New York 10994,

Already Flaregas Corporation have had a considerable degree of success and they briefly report as follows:

The first months of operation have been taken up with getting familiar with Flaregas equipment and methods and Ralph Ortiz spent some weeks in Europe visiting Flaregas offices, installations and even commissioning a system in Spain. On his return a concentrated campaign was launched to "spread the Flaregas word" across the United States. This campaign has already paid off in the form of three major contracts:

The first was a contract for two FC-72 Flare tips complete with stainless steel Flarex seals and ignition system for Wellman Power Gas.

The second was an FS-16 ordered by Sun Oil Company for their Sarnia, Ontario plant.

The third is a contract that will be keeping us happy for some time to come and represents a considerable amount of effort from both sides of the Atlantic. It is a complete system ordered by Lummus for the Algonquin Gas Transmission Company consisting of a rectangular ground flare and an Anti-Pollutant self-supported 42" diameter elevated flare, 200 ft. high complete with FS 42 Flare tip. The system is operated using diversionary Water Seals and the order includes Engineering, design and supply of all equipment including the major structures. The system is expected to be on stream in mid 1973.

From FRANCE - Our Agents and Associated Company -

Airoil Francaise S.a.r.L., 23 Rue de Lille, (94) Maisons-Alfort, France.

report a successful completion of the GEXA/TECHNIP contract for the 6-stack Flare system to be installed at the Orenburg (USSR) Natural gas purification and sulphur recovery plant. The 400 tons of structural steel work with Flare tips, Flarex seals, ignition panels and KO drums were loaded on to two trains bound for Dunkirk and thence by sea to the USSR. Fears of delays, which had been expected for a number of reasons, were completely unfounded and much to the credit of the fabricator and Airoil Francaise quality control, there were no rejections other than the most minor items. The clients were pleased with the ease with which this contract was completed and any doubts which they might have had at the outset were quickly dispelled.

Whilst the production side of Airoil Francaise has been kept busy with the "Russian job" as it has been affectionately named, their marketing efforts have been turned towards FS tips in France. Whilst the FS 60 in the Elf complex at Feyzin and the FS 48 at S.C.C. Carling are still operating satisfactorily, no new ones have been commissioned until recently. ESSO have now ordered two Anti-Pollutant tips from Airoil Francaise and the first, an FS-36 has just been commissioned successfully at Port Jerome. The second tip, an FS-20, will be installed at the ESSO FOS Refinery near Marseille in November 1972.

From GERMANY - Our Agents and Associated Company -

Quietflo Engineering Limited, 4 Dusseldorf, P.O. Box 6433, Western Germany.

report that the joint efforts of Flaregas Engineering Limited and Selas of America (Nederland) NV, have resulted in a contract for two flare systems for Lurgi. Both will be installed in Western Germany and both systems include the following Flaregas items which will be supplied from the United Kingdom:

A non-smokeless flare tip series FN-42"

A Flaregas patented Flarex seal size 42"

An explosion-proof flame front generator panel

The stack sections, together with ladders, platforms, pipework and ancillary equipment, which is being designed, supplied and installed by Selas, will be to German standards.

Further joint efforts are anticipated following the successful completion of this contract.

A further item of considerable interest is that the first Flaregas FS anti-pollutant tip will soon be installed in the BASF complex at Ludwigshafen. The tip, an FS-28, will be on stream by the end of 1972 and was ordered by BASF as the "quietest Flare tip" on the market and for that reason, a very low noise level to meet their stringent specification was guaranteed by Flaregas as well as the Standard guarantee covering performance and materials. Guaranteeing the noise level that will be produced by the Flare will involve Flaregas in sending a qualified acoustical engineer to take readings immediately before the Flare is commissioned and immediately afterwards. With the experience Flaregas has had in supplying flare systems for low-noise areas, this type of guarantee can be undertaken in most cases where noise is a problem.

From HOLLAND - Our Agents and Associated Company -

Airoil Engineering (Nederland) N.W., Aaltje Noordewierstraat 332, Loosduinen, The Hague, The Netherlands.

report that an FS-48" Anti-Pollutant flare unit delivered to DOW Chemicals for their Terneuzen complex, has been successfully commissioned.

The tests on the Flaregas "mini-stack" sold to Bechtel in The Hague, mentioned in "FLARE", Issue 1, have now been completed and full test data on heat radiation, luminosity and sound levels is available for those interested.

An edited coloured film of seven-minute duration, taken during the course of the tests, is available and can be loaned from the Flaregas Library on request.

From Scandinavia -

It is reported that the Flaregas FS-18 flare tip installed earlier this year at the SHELL SOLA refinery in NORWAY has met with the local residents' approval. This anti-pollutant flare tip was purchased by SHELL SOLA as a replacement for competitive equipment and since commissioning, has been operating to the satisfaction of both the refinery and the local Authorities. Flare noise, which had been a source of discontent to both refinery staff and their neighbours in the small community of Sola, has now been reduced to a level acceptable to all parties. Once again, the Flaregas anti-pollutant Flare System has been successfully used as a "solution to pollution".

From ITALY - Our Agents and Associated Company -

Airoil Italiana, S.R.L. Via Achillini 16, 20162 Milano, Italy.

report that the three portable Ethylene stacks ordered by Montecatini Edison are in the final stages of manufacture. (They are basically similar to the portable stacks supplied to I.C.I., Billingham, in 1968 for their trans-Pennine Ethylene pipeline). The stack sections are constructed from heavy wall aluminium pipe to cater for the very low temperatures involved in the venting of Ethylene to the Flare. Each stack is equipped with a non-smokeless flare tip, three guy wires, one natural draught pilot assembly, a TRIBOLITE ignition unit and a swivel base. At various positions along the pipeline, flare bases together with deadman anchors are installed.

In the event of the need to evacuate a section of the pipeline, the portable stacks are transported to the base on a truck. The stack is assembled on the ground and then erected into position using the swivel base and guyed off by the three wires. The gas for the pilot, normally Propane, is provided from a cylinder carried on the truck. Ignition of the pilot is carried out using the patented non-electric TRIBOLITE unit.

After use, the stack is taken down, dismantled and taken back to the storage area for future occasions. By virtue of its function and use, the complete unit is of robust construction with a very minor maintenance requirement.

Enquiries for these portable units are being received from various countries and it is anticipated that many more of these units will be in use during the coming year.

Airoil Italiana have also recently reported successful start-up of the two FS 48 stacks at Porto Marghera near Venice for Montecatini Edison. These two large anti-pollutant Flare tips, which were mentioned in Flare Issue 1, are operating very successfully despite a fractured steam line which briefly stopped steam to the system and prompted one local newspaper to a banner headline indignantly proclaiming:

"CHI REGALA A VENEZIA IL "CAPELLO" DI FUMO"
a rough translation being . . . "Venice under a BLANKET OF SMOKE"

We are, needless to say, pleased to announce that after a speedy repair to the offending line, all is now quite at Venice once again and the two tips are working to everyone's satisfaction.

From SPAIN - Our Agents -

CEICO, Capitan Haya 74-8° Madrid 20, Spain.

report that their continuing endeavours have resulted in contracts for anti-pollutant systems.

Paular S.A. have ordered one FS-30 Anti-Pollutant system. The complete structure consists of three stacks arranged in a triangular pattern, the major one of which is 30", the other two are of 20" and 6"; all three are tied together with allowance made for differential expansion. This system has now been in operation for eight months following its successful commissioning.

Gulf have ordered an FS-36" Anti-Pollutant system of 100 metres overall height.

Petronor have ordered an FS-60" Anti-Pollutant system of 85 metres overall height. An 18" line which is tied to the main structure enters the stack at the Flarex seal level.

Each of the systems was installed using the Flaregas 'one piece lift' erection technique.

From JAPAN - Our Agents -

Okura Trading Company, 3-6 Ginza Nichome, Chuo-Ku, Tokyo 104, Japan.

report a successful start up of the FS-36 Anti-Pollutant Smokeless Flare System, supplied to Mitsui Petrochemical Industries for their IWAKUNI-OTAKE Plant, following the annual scheduled shut down. The plant now has in commission measuring equipment installed to obtain accurate information concerning the behaviour of the flare.

The following actual information was recorded during the start-up:

Mitsui FS-36" PERFORMANCE DATA TAKEN AT START UP Saturday 30th October 1971				
Time	10.10	10.30	11.40	1.58
Gas	Propylene 80% + cracked gas 11,000 Nm ³ /hr (21 TON/HR)	Propylene 80% + cracked gas 20,00 Nm ³ /hr (38 TON/HR)	Ethylene 40,000 Nm ³ /hr (50 TON/HR)	6,000 Nm ³ /hr (20 TON&HR)
M.W.	40	40	28	28
Steam Rate	7.5 TON/HR	11 TON/HR	12 TON/HR	12 TON/HR
Noise Level At 200 M from Base of Stack	58 dB	63 dB	63 dB	64 dB
			Noise Level at 150 M	67 dB
Flame Condition	Smokeless	Very slight smoke		Smokeless

FLAREGAS exhibiting at the
Anti-Pollution Exhibition Tokyo.

