Informal Notes of a Meeting with HSE at Bootle on 10 December 2003 to discuss Gasoline Pipeline Risk Assessment methodology

11 December 2003

Present:

HSE

Martin Goose
Peter Sargent
Steve Porter
Ian Hirst
Richard Thomas

Representing UKOPA

Rod McConnell

The purpose of the meeting was to explain the points raised at the meeting at Daresbury held on 25 November.

1 Successful Points

1.1 The point I made over the "pinhole" 100-metre delayed ignition pool, which dominates the risk in HSE's PIPERS model, was recognised as being valid by HSE. This means that PIPERS cannot be seen as "fit for purpose" as declared in Peter Sargent's paper to ACDS on amendments to PSR issue in July 2003. Further work will be carried out to develop the model.

1.2 The points raised will be the subject of a paper to MSDU Risk Assessment Panel at the end of January. This paper will be prepared by Steve Porter, Ian Hirst and Martin Goose, and will recommend HSE's improved methodology. Notes of the Panel meeting discussion will be made available. Any further information or papers which they could take into account must be sent to them asap.

1.3 There are indications that as a result the LUP zones proposed by HSE at the 25th November meeting will be reduced. Though no promises were made, the mechanics of the calculations will reduce the zone sizes, once a more realistic approach is taken to the delayed ignition pinhole scenario. The most telling comments were made as a parting shot as I was leaving – I said something like – hoping we can resolve this, but the industry couldn't possible accept LUP zones of 50 to 80 metres – to which Martin replied – if the results of the risk assessment comes up with something like zero metres inner zone, 15 metres middle zone, and 30 metres outer zone, he would have no objection.

2 General Discussion

2.1 General impression was of a reasonably friendly, open meeting with good opportunity to explain the reasoning behind the arguments put forward previously. I was particularly pleased that Steve Porter and Ian Hirst were there - rational "risk assessors" with many years experience. I was able to go through a paper copy of the overheads I used on 25th, and also a print-out demonstrating the PIPERs calculation.

2.2 Their initial remarks were that the glitsch I had found in PIPERs in the 50-60% contribution to risk of the delayed-ignition pinhole was correct, and so they had to re-think the scenario using a more realistic scenario – the sort of idea was that perhaps an 8-hour delayed release could occur. They distanced themselves from the development of the model – I confirmed that I didn't believe it was in the same league as some of their other models.

2.3 I made a strong point at the beginning that any methodology development should be clear, rational and transparent so that the industry could understand why and how any LUP zones had been developed. Steve Porter acknowledged and agreed with this.
We reviewed the point made by Martin at the end of the meeting on 25th – that the need for LUP zones for gasoline was on the edge of the horizon depending on which assumptions were made. It became apparent which side of the horizon HSE see the risks – the debate

was to be essentially factors affecting the size of zones – not whether there should be zones. Detailed aspects discussed were:-

2.4 Rate of leak – Leak Detection Systems (LDS)

Martin confirmed his view that unless LDS were mandatory, they were unable to take them into account, but that he would need to consult his field colleagues for details. Steve Porter was very interested in what is in use and what pump shutoff and isolation facilities are available in the event of a leak. Now is the chance to pass him information which he could use in the Paper to Panel – would it be possible to quickly assemble the following information? :-

Details of UK gasoline pipeline systems?

Details leak detection systems on each system?

- how they operate,
- what size leak they can detect (what do suppliers claim?
- What is actual experience?
- What checks, trials, tests are done?)
- What is on-line time for the leak detection system?

Details of resulting actions on detecting a leak

- where leak would be detected? – 24 hour manned?
- What are actions taken?
- How are pumps shutdown – remote or local? How long?
- Where are isolations?
- Are they field or remote?

As much of this data would be very helpful for convincing them that these systems should be taken into account when assessing the duration and size of releases.

However, the info is required asap.

2.5 Failure rate data

Although recorded as a second-order aspect to the risk assessment I strongly made the point that

a) UK failure rate data was lower than for CONCAWE Europe or EGIG

b) Many features (wall thickness, design codes, 3rd party protection, surveillance, corrosion CP protection, Natural failures etc) were equivalent to the data we (including HSE) have obtained for Gas pipelines, so the use of overseas data is over-pessimistic. In due course we (UKOPA) would be addressing the applicability of failure rate data to gasoline risk assessments.

c) We are actively progressing development of the Predictive Modelling Limit State models with Advantica and would hope that HSE would also collaborate in the work

2.6 Size of Pinhole

Made the point that the failure rate data as applied may not be truly represented by modelling a 10 mm hole – this was recognised but not really registered.

Now we know how HSE use rupture frequency (= 2 x open ends), we must be more careful in collecting data, and

a) distinguish between rupture (= between large hole and full pipe diameter) and Guillotine Rupture (= greater than pipeline diameter)

b) ensure true pinholes (less than 2 mm) are registered at this size, and the next size 3 mm to, say, 25 mm are called small holes.

HSE agreed that their 10 mm hole was really modelling “small holes” and that appropriate data should be used for the frequency of such events.

2.7 Soil Permeability / Ground soak-in

I re-made the points which came up at the 25th November meeting – some sympathy to the approach, especially regarding small hole subterranean leaks. Steve Porter raised a point I had not appreciated – how do you model soil permeability? What are the equations?

Apparently Ian Lines had developed his own equations for the W S Atkins work. Perhaps we should investigate further? Any thoughts?
Ian Hirst raised the thought that the impervious spreading pool was taking into account conditions when the soil is already fully saturated with rain and the pool spreads over the water surface – or perhaps the ground is frozen and impervious.
I got the impression that soil permeability is unlikely to be included in their improved model.

2.8 Escape Factor / Fatality assumptions

Good discussion of Atkins thoughts about people escaping from the developing immediate ignition pool of gasoline. Also emphasised the thought that the real impact on the risk contours is the assumption of 100% fatality in the pool – the elaborate calculations of wind/weather and flame tilt etc outside the pool have a relatively small impact on the overall risk distances. Urged HSE to consider Atkins points regarding escape from a developing pool as well as smell detection and escape from un-ignited pools. Martin again made his points about "rubber neckers" getting involved in such incidents.
Drew analogy with development of PRAM to MISHAP – the former assumed persons were outside and no escape whereas the latter assumes 90% indoors with a significant reduction in LUP zones and 2.5 m/sec running away from jet fires.
Steve Porter made the point that the 100% fatality in the pool is trying to compensate for two aspects:-
a) the possibility of the gasoline percolating up through the soil and so catching people within the pool
b) incorporate aspects of the instantaneous spray fire which would engulf people.
Any examples from actual incidents would be of interest to Steve Porter – is there anything we could send him?
I got the impression that escape is unlikely to be included in their improved model.

2.9 Hydraulic Gradient – different zones for lower pressure sections

This point was of interest – Martin indicated that if different sections of pipeline were notified with different MAOPs, the LUP zones might be different. However he would not expect 50 notifications for one pipeline to be made! Alternatively, this may be an aspect which detailed re-calculation of risk by a Planning Applicant's Risk Consultant might take into account for an actual planning development.

2.10 Multi-Product Pipelines

No change here – if a pipeline is notified for gasoline the LUP zones would apply at all times.

2.11 Need for LUP Zones

Towards the end I again raised the need for LUP zones for gasoline – with the calculated frequency of a fatality of 1 in 77 years, and the maximum foreseeable societal risk potential for perhaps no more than 10-20 fatalities, surely gasoline pipelines were a low priority major accident potential? Steve Porter made the point that nothing prevents a football stadium being built or open air pop concert being held over a gasoline pipeline, so the worst case societal risk could be much larger – as a minimum an outer zone is required to limit most vulnerable or very large numbers of people being affected.

3 Further Aspects Discussed

3.1 Martin made a strong point about HSE's withdrawal for producing any Guidance – this was in response to a query as to whether HSE would re-issue the booklet on PIPERS so we could fully understand how it works. He is expecting an extra allocation of funds to help with the backlog of risk work.
I mention UKOPA's plans to develop the programme of work and the possible levels of expenditure we could allocate (including the Advantica work) and if this could be of mutual interest, perhaps we could work together on some aspects. Martin thanked me for this offer, and said he would bear it in mind.

3.2 I was able to go through out ongoing programme of work in some detail to the open forum which I think was useful – at the end of the meeting Martin was in a more receptive mode and was not confrontational when I mentioned the possibility of resuming cooperation on some aspects.

a) Transco / BGS work – Martin asked what will the work result in and I replied that Transco were evaluating that aspect at present

b) Predictive modelling – progress on the Advantica proposal and our plans to progress this work in 2004

c) Slabbing – that we were preparing a paper and hoped to be able to share it with HSE soon – I asked perhaps it could be submitted to their Panel for acceptance? They were receptive.

d) Ethylene – I again mentioned where we had reached with MISHAP replication and that we are keen to see the LUP zones re-assessed – no specific reaction from HSE.

e) Spiked Crude – as for ethylene

f) Gasoline – the need to generate a transparent methodology for risk assessment

3.3 Martin was tickled when I mention that one of our members fully expected him to strike his quote “HSE do not attempt to model reality”. He even provided one or two more notable quotes such as a description of HSE risk assessment methodology as “shrouding Policy in a cloak of scientific respectability”

3.4 Peter Sargent asked if I could assist with a CAPELG working party which he is currently assembling (it will include Jane and probably Neil) as someone who has knowledge of emergency procedures associated with pipelines containing toxic materials. I mentioned Kish Shah, but agreed to seek guidance from UKOPA as to who could help.

3.5 Richard Thomas briefed me on progress with the P5 committee which is reviewing methodologies. They now have questionnaires and lists, and have broken down the tasks by priority and usage. Hopefully I will be summoned to take part sometime in the New Year.

4 Further Actions

4.1 HSE to produce paper for Panel at end of January

4.2 RAMcC to produce technical paper for WGP

R A McConnell

Planning Applications near Hazardous Installations (PADHI)

Summary of Land Use Planning Advice from HSE - see full Guidance Document for details

Sensitivity	Inner	Middle	Outer
1	✓	✓	✓
2	✗	✓	✓
3	✗	✗	✓
4	✗	✗	✗

Sensitivity	Description
1	Offices, factories, warehouses, depots, farm buildings, non-retail markets, builder's yards - occupants can be organised in an emergency - public not present or only in small numbers Infill developments, 1 or 2 dwellings Accommodation less than 10 beds / 3 caravans Access roads, railways, tram tracks

Sensitivity	Description
2	Houses, flats, retirement flats, bungalows, caravans, mobile homes, hotels, guest houses, hostels, holiday camps, halls of residence - people live - difficult to organise in an emergency - public not present or only in small numbers Developments up to and including 30 dwelling units, not more than 40 per hectare, not high density Motorways, dual carriageways major transport links Accommodation up to 100 beds Restaurants, cafes shops, filling stations superstores, small shopping centres, stations terminals, 250 to 5000 m2 floor space Food festivals, picnic areas, Community centres Outdoor markets, funfairs (less than 100 people)

Sensitivity	Description
3	Hospitals, Convalescent homes, nursing homes, old peoples homes with warden onsite, sheltered housing, nurseries, creches, Schools and academies for children up to school leaving age Prisons, remand centres Places providing an element of care or protection, people vulnerable to injury, emergency action and evacuation very difficult Developments with more than 5000 m2 floor space where public can gather (retail, terminals, stations, Open air developments likely to attract general public 100 – 1000 people at one time

Sensitivity	Description
4	Large Hospitals, Convalescent homes, nursing homes, old peoples homes, sheltered housing, nurseries, crèches – vulnerable people, larger than 0.25 hectares Large Schools and academies for children up to school leaving age – larger that 1.4 hectares Open air developments likely to attract general public more than 1000 people at one time – Theme parks, Sports stadium and events, open air markets, outdoor concerts and pop festivals